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REASONS SUGGESTIVE

OF

Mining on Physical Principles

FOR

GOLD AND COAL.

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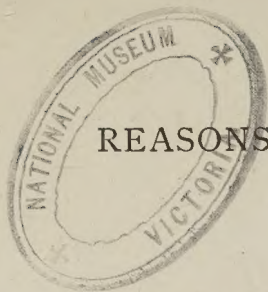
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REASONS SUGGESTIVE
OF
MINING ON PHYSICAL PRINCIPLES
FOR
GOLD AND COAL.

A Review of the Assumptions of Geologists,

"An unreflecting and implicit faith is as fruitful of error as too bold a spirit of curiosity can be."

By J. WOOD BEILBY,

*Author of "THE TRUE THEORY OF THE EARTH, AND PHILOSOPHY OF THE
PREDICTED END," "AURIFEROUS DRIFTS IN AUSTRALASIA,"
"FACTS FROM THE ARCANA OF NATURE," &c.*

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CONTENTS.

	PAGES
DEDICATION	5
INTRODUCTION	7

CHAPTER I.

Assumptions in Mr. Brough Smyth's Report of the Progress of Geological Survey in Victoria, of the uniform action of trivial causes of denudation, with crumpling of strata—Development of a <i>Force</i> , or motive power in Nature, necessarily productive of such phenomena, as a sequence of its operation—On Polar ice accumulation, and its effect upon the Earth's equilibrium, as that of a spheroid equably poised in space—Hypothesis as to open unfrozen polar seas, and natural production of rock salt, and its occurrence as an evidence of former glacial conditions at its site—Some prominent oppositions of authorities in science to exercise of <i>common sense</i> in deducing opinions; and "oppositions of science, falsely so-called," to the statements of Scripture	9-22
---	------

CHAPTER II.

Theory of the Earth's central heat, causing upheavals, combated—Results of a loss of equilibrium by the Earth as to change in position of sites of defined latitude and longitude—Theories of the Precession of the Equinoxes, and of the Oceanic Tides, and a new interpretation of these phenomena—A recession of the sea from certain coasts, <i>not</i> a silting up of their harbours—Hypothesis as to the date of erection of the Great Pyramid, and as to the intention of the stone-coffer in the King's Chamber—New ideas as to age of the "cave-men" and animals—Hypothesis as to ancient drifts, and deposits therefrom—Questions of deep importance to navigation, in securing the safety of all mariners at sea	23-45
--	-------

CHAPTER III.

	PAGES
Existing aspect of geological or theoretical assumptions to mining—On the formation of Coal by drift and concretion of marine vegetation; its place of deposit, and the mode of search for it suggested—Variance of our Victorian geologists' ideas as to occurrence of payable auriferous drifts, with the results of Californian and Victorian experience in mining—Encouragement to mining on physical principles in search of lost reefs and gutters, in old as well as new claims—Description of an economical boring apparatus	45
Concluding remarks	53

DEDICATION.

TO

R. BROUGH SMYTH, F.G.S., &c., &c.,

*Secretary, and virtual Head of the Victorian Mining Department ;
and Arbiter of the Gold Discoverers' Reward
Appropriation Fund,*

To whom the Author is *indebted* for the Department's persistently inconsiderate denial of his claims to recognition for public services to Mining :

1st. As the first publisher to Government (June 7, 1851) of the discovery (by another, then deceased) of a stated locality disclosing a deposit of payable alluvial gold in Victoria : and this at the critical period when an alarming exodus of Victorian population to the Bathurst gold-fields, and consequent paralysis of Victorian industries, was imminent ; the *priority* of publication of the then cheering news being amply demonstrable by incontrovertible evidence recorded in the Chief Secretary's archives, and by reference to the Melbourne daily press of its stated date. But while R. H. Hargreaves, the abundantly-rewarded discoverer of gold in New South Wales, who drew off our population to foreign diggings thereby, has been rewarded by the Victorian Legislature with honours and a grant of £5,000 ! the well-meant attempt of the *local* discoverer (that is, the *first publisher* of

the discovery) to encourage prospecting for gold in Victoria, has been, in every reference of the question to the Secretary of Mines, persistently ignored by him, and declared in no way meritorious !

2nd. As being the first prospector (with two others), in April, 1864, of the Red Hill Creek (now named the Cross-over) gold-field, Gipps Land ; and as having located thereon a population—the nucleus of the Buln-Buln agricultural settlements—in what was previously a desolate and almost inaccessible mountain region, by drawing public attention to facts of gold discoveries by (duly published) letters to the nearest wardens and the Melbourne press ; as, also,—with sketch of the gold-field—to the Hon. J. F. Sullivan, the then Minister of Mines, yet the vote of £10,000 for gold discoveries in 1864 lapsed to the Revenue as being unclaimed by *bona fide* discoverers.

In acknowledgment, therefore, of these and other encouraging modes of promoting mining enterprise in Victoria, conducive to its existing state of depression, characterized by the honourable Member of Parliament for Ballarat, as that of an “industry fast dying out,” this little work is inscribed (without permission) by

THE AUTHOR.

P.S.—If Victoria were but blessed with a Minister and a Secretary of Mines, and some few liberal-minded mining capitalists, having the clear-sightedness, energy, forethought, and indomitable perseverance of that enterprising and model colonist, Mr. Murray Ross, of Rosstown, the present and future state of Victoria, in every phase of prosperity deducible from successful mining, might be the glory of the Southern Hemisphere,—a focus to which population *from* all parts of the world would eagerly be attracted.

"AN UNREFLECTING AND IMPLICIT FAITH IS AS FRUITFUL OF ERROR AS TOO BOLD A SPIRIT OF CURIOSITY CAN BE."

INTRODUCTION.

THE following Essay having been written some months ago for the Victorian Royal Society, and handed to its President for perusal before its submission to the Council of the Society, that gentleman expressed his hope that it would be read on a stated day of meeting of the Society, and "be dealt with in manner conducive to the interests of science, and at the same time satisfactory to its author,"—who had protested against the pooh-pooing of such subjects as *the physical cause of the recession of the sea, and apparent rise of the land, on the coasts of Australasia*, by a member of the Council of the Society, who had asserted that "such changes were common, and easily understood," without any attempt on his part to explain them. With this protest before them the Council of the Society rejected the paper.

But if learned societies decline to discuss unaccepted opinions, based on researches in nature, either because they are opposed to those held and taught by some of their members, or else fear that they may compromise themselves as a body, by seeming for a time to endorse views which are not put forth by an acknowledged scientific authority, but can only be tested by such a searching inquiry as it is in their power to institute, it becomes evident that they are falling away from the end proposed in their institution, and, instead of aiding, render themselves real impediments to the advance of science. The writer, desiring that his opinions

may be examined, in order, if they are incorrect, that their fallacy may be demonstrated, now publishes them that science generally may scrutinize them. Recognized *facts* forming the common store from which all must draw the bases of scientific inductions, every established fact added to the general stock is an actual gain ; and so long as a possibility of error exists in preconceived opinions, every new system of interpretation of natural phenomena by an earnest investigator, untrammelled by rigid adherence to authoritative opinions, where absolute proofs are wanting, is entitled to a hearing.

In this Essay, as recently re-written for publication, will be found allusions to questions not submitted to the Royal Society, but of interest alike to the scientist and theologian. In the lecture on Science and Scripture, by the Bishop of Melbourne, he avowed his belief that "much of what is called science is nothing else than arbitrary and unphilosophical hypothesis," yet, as "not possessed of extensive scientific knowledge, he implicitly believed, and had no more doubt of" certain theories of science than he had of the most important passages of the Divinely inspired narration of Gospel truths. Yet these theories may be but feasible explanations of natural phenomena, perhaps, therefore, misinterpreted ; and, but for this mode of shelving such questions, by assuming their position as on a basis of truth, analysis of them by earnest investigators, might result in discovery of facts pointing to wholly different conclusions. Leaders in theology, especially, should be careful to take nothing for granted without adequate proofs, when militating against any apparent assertion of the Deity, conveyed by inspiration to the writers of Sacred Scripture. If they do, they abandon their high prerogative as casuists.

"Like the flood which tests the security of every foundation that stands in the way of its onward rush, overthrowing the house built only on the sand, but leaving unharmed the edifice which rests secure on the solid rock; so does a new method of research, a new series of facts, or a new application of facts previously known, come to bear with impetuous force on a whole fabric of doctrine, and subject it to an undermining power, which nothing can resist, save that which rests on the solid rock of Truth."—*Dr. W. B. Carpenter, F.R.S.*

CHAPTER I.

CONTENTS.—Assumptions in Mr. Brough Smyth's Progress Report of uniformity of action of trivial causes of denudation, and the crumpling of strata—Development of a FORCE in Nature necessarily productive of such phenomena—On Polar Ice accumulation and its effect upon the equilibrium of a spheroid poised in space—Hypothesis as to unfrozen polar seas and production of rock salt—Opposition of authorities in science to common sense opinions—Oppositions of science, falsely so called, to Scriptural statements.

IN the recently published Report by the Secretary of Mines of the Progress of Geological Survey in Victoria, he alludes to auriferous gravels being found under marine fossils (page 11), and asserts evidence of enormous denudations across the central third of the Australian continent.* His "desire is that the result of his mapping out of strata from surface indications may give a view of their configuration, not as separate and distinct, but as having close connection with each other."† And he stated "primary object is to make known observed facts relating to the structure of the earth's surface, and to place in due order of succession the several rock formations which present themselves to view;" and he "alleges that the maps compiled by him give for the first time the lines of strike of upper and lower Silurian rocks."‡ Mr. Brough Smyth has evidently most assiduously and carefully compiled from many sources of information, and if he ignores physical laws as tending to alteration of structure of sections of rock formations, and thus affecting the accuracy of his delineations of their strike and dip, and occurrence of marine or other fossils in them, or in drifts composed of their detritus, it is doubtless because his training, like that of nine-tenths of other geologists and palæontologists, did not contemplate necessity for consideration of Nature's laws as to the development of *forces* tending to dislocation, denudation, and disintegration of rock formations, and to the drift and deposit of their particles. The object of the writer of this paper is to endeavour to demon-

* Page 20.

† Page 14.

‡ Page 15.

strate the action of natural laws in evoking a *force* of irresistible energy in accomplishing changes of structure of the crust of the earth, by decomposition of rock formations, and re-arrangement of their particles. But in advocating the conjunction of physical knowledge with purely geological science, the writer trusts it may not be supposed that he seeks to derogate from the value of the labours of the Secretary of Mines towards progress of knowledge of geological facts, but to evoke caution in formation of hypotheses, or theories, intolerant of the views of other investigators of natural phenomena, resulting in varied local deviations from the regular sequences of stratifications, *conjectured* as accurately defined, by the Secretary of Mines and other geological authorities.

It must be absolutely impossible to construct a reliable geological map of any district, not to speak of a province or country, unless the *extent* of dip and dislocation of strata, and of areas, within which are subversions and crumpling of previously horizontal stratifications, can be definitely ascertained, or reasonably deduced from consideration of physical agencies, necessarily operating in the extension or limitation of such effects. Attempts to define consecutive strata from a here and there view of outcropping edges, without regard to natural features indicating the probability of strata receiving, by violent causes, varied inclinations or subversions, and rendering it problematical whether such supposed sequences of rock formations justify the hypothesis current with some geologists that a total depth of consecutive formations to the amount of 10,000 feet is thus predicated, result in a charting of *suppositions*, assumed to be ascertained scientific facts. Hence, perpetuation of the false bases upon which already too much crude assumption has been built, standing antagonistic to discovery of truth by being taught as fact, and thus turning aside efforts of earnest investigators to search otherwise than in the ways heretofore accepted by science. These crude speculations when set forth as facts become, indeed, a most dangerous barrier to progress of scientific *truth*. Mr. Brough Smyth, while generalizing on his one-sided view thus of noted outcrops, admits that "a large part of the colony is for all practical purposes unsurveyed geologically, and discoveries are made from day to day quite altering our views respecting the areas supposed to be occupied by certain formations." I may therefore, perhaps, be pardoned for a few suggestions which may pave the way for reception of facts attainable by investigation, and lead to a new interpretation of these as disclosures of geological truths subverting some former hypotheses.

In examining the structure of any section of the earth's superficies, copious evidences present themselves of the former action of large waterflow ; its general course, as denoted by diluvium, being nearly north and south, the course of existing stream beds being modified by the trend of the mountains, and their ravine cleavage. It appears that immense valleys have been excavated, refilled by sedimentary deposit, and re-excavated again and again, deep gorges eroded, and hillsides torn down, and their strata crumpled or subverted. Here, huge masses of granite crop up. There, basalt reposes between beds of alluvium, containing organisms of recent age, side by side with water-rolled fragments of gold and minerals. According to current theories of production of such aspects of the earth's crust by a uniformity of almost quiescent degeneration during countless myriads of years, the geologist, from the limited data open to view, maps out the depth, and dip of the disclosed strata, the imaginary course of lava streams, and of igneous upheavals of molten volumes of primary rocks, on the assumption that only such upheavals can have formed the mountains, or distributed masses of granite and some other rocks to the site of their present outcropping. Evidences of the abrading action of tumultuous volumes of water in eroding the hillsides of vast valleys among the mountains, by lines apparently of parallel horizontality, termed *striæ*, (though miniaturized in every feature precisely by the markings on new straight cuts, in small stream beds, denuded of protecting sward and vegetation),* are asserted as only explainable as having been grooved by ice. Coal deposits are defined as agglomerated layers of tropical forest verdure, without due consideration of the necessity for some vast fluvial or other aqueous agency, to tear away, drift, and deposit *en masse*, in natural basins, the tree stems and foliage, and overlooking the fact that a precise counterpart of such (supposed tropical) foliage presents itself in certain *submarine* forests and sea meadows in various parts of the world, and that the assumption that accumulations of the latter description of vegetable matter, torn from its place of growth, and drifted to its site of deposit by the throes of a convulsed ocean, and therein subjected to enormous pressure by the superincumbent ocean, and deposits therefrom, more feasibly accounts for formation of coal. Geologists too often theorize on igneous action as one agency of concretion of earths, but the permeating element of rock concretion is as yet a problem unsolved. Many stratified rocks, composed of minute particles of hard

* For instance, the Dandenong Creek at the Dandenong Bridge.

material, without a natural tendency to be attracted to, or adhere to each other, are found concreted into a dense, and sometimes crystallized mass. One species of rock, nummulitic limestone, the material of which the Egyptian Pyramids are built, and of great durability, consists mainly of the perfect shells and shields of a molluscos animal, which would certainly have been decomposed by heat. So also would most minerals ascribed to igneous origin. It appears evident that the agent of concretion is mineralized water, probably acted upon in the laboratory of nature by currents of electricity, and thus that metals and minerals are elaborated from masses of earths in a fine state of comminution and water commingled, the metals concreted in veins, or nodules, and the minerals into their incasing rocks. Some geologists consider basalt as lava; others, and earnest investigators too, regard it as an aqueous concretion. Its appearance in detached blocks in the quarry favours the latter view. The Arctic explorers, Dr. Kane and Sir John Richardson, both mention the basaltic crystalline arrangement of columns of ice.

In the words of Dr. Brande, F.G.S., "Geology is thronged with records of strange and mighty changes and convulsions, of revolutions of climate, . . . of periods when our present continents were at the bottom of the ocean, from which they seem to have been elevated sometimes by the slowest degrees, and at other times by a more rapid and violent cause." Other geologists admit that the science discloses evidences that, times and again, while frigid, tropical, and temperate zones have been transposed in almost every part of our earth's surface, the ocean has alternately submerged and withdrawn from every quarter of the known world, even rising and leaving traces of presence of its sea bed to vast altitudes on the highest mountains. But our Victorian geological authorities assert that these phenomena are the simple result of an (imaginary) system of upheaval, "easily understood;" and that the changes traced by investigators as resulting from tidal waves during these periods of oceanic overflow, in subversion of masses of strata, torn down from lofty plateaux, or rifted out of the solid mountains by landslips on a stupendous scale; excavation of vast valleys and precipitous glens; collection of water-worn fragments—often of huge, boulder-like dimensions—of the crystalline rocks, in ancient valleys, and their deposition in the eroded gutters of current flow; the mechanical commingling of earthy matters, held temporarily in suspension in the agitated ocean until deposited (as we see them presented in our railway cuttings), the coarser rubble first, in varied layers or strata, surmounted

by the finer particles, longer of precipitation, and forming our surface soils ;—are each and all but evidences of action of such trivial causes as rains, atmospheric abrasion, and action of streams or petty brooks during an infinity of ages of time.

By such reasoning, and deducing from observations of relics of man and other organic matters, being commingled in deposits, deemed thus of vast antiquity, the hypothesis that man's age upon earth far exceeds the stated 6,000 years of the Mosaic history, a grievous doubt of the accuracy, and an obloquy of a wilful perversion of truth is thrown in regard to the narratives of Holy Writ. Yet geologists of this school professedly reconcile their theories with the authenticity of Scripture, while undermining its veracity as the revealed Word of the Great Author of Nature, by assertions that it was not revealed in the interests of scientific teaching, and that to the minds of *savans*, designated authorities in science, the disclosures of geology do not support but disprove its dogmas of the *period* of man's advent on the earth, and the fact of occurrence of Noah's mighty desolating flood over the historically-noted "face" of the earth. And they farther build up theories as to development of faculties of civilization in man from his supposed originally savage state when a dweller in a cave, co-existent with the more ancient animals, now extinct on the known portions of our globe. Our theologians unfortunately are, almost to a man, now that Peter Menzies has gone from us, disinclined to grapple with such questions. They, like many geologists and paleontologists, are not read up in general data of science, and therefore take far too much for granted the accuracy of assumptions, set forth as the asseverated facts of scientific demonstrations of accredited scientific authorities. Hence, they are insidiously led into derogation of the works and primary designs of the all-wise Creator, and thus they too virtually uphold the supremacy of Nature, and side with those who atheistically say of the one Author of Nature and the sacred Word, "He hath no hands."

To geologists of this school, time is all they want to accomplish, by the most ephemeral agencies acting in succession, all changes of surface—the result of denudation and deposition, and time they demand, the Scripture accounts of creation notwithstanding. Mr. Brough Smyth asserts that the change in aspect from that of a vast plateau to a deeply furrowed mountain chain, abounding in lofty peaks, "deep gorges, almost lost in haze," and broad valleys, has been fashioned only by rains, snows, and streams, during vast

periods of time. Yet the physicist may trace the links of operation of natural phenomena now in progress, yielding a FORCE productive of catastrophic action at epochs alternating with periods of such uniform action.

But we must proceed in our search after this primary Cause, *out* of the realm of Geology, and call upon its sister sciences to divulge their secrets of workings in Nature, and Meteorology, and Mechanical (Natural) Philosophy, come amply to our aid. Meteorology discloses—first, that certain natural laws must be obeyed in the elevation to high regions of the atmosphere, and conveyance therein by currents, of vapour, drawn by solar heat from areas of yield; and—secondly, that natural laws must be obeyed in the circumstances of precipitation of this air-borne vapour. These laws are that tropical vapours proceed polarly, and are only liable to condensation and precipitation by contact with an atmosphere cooled to the degree necessary by surrounding circumstances. Hence, it is ascertained by the meteorologist, that next to the tropics, the higher latitudes have the largest precipitation of condensed cloud vapour in the various forms it assumes, and that such precipitation is largely influenced by presence of lofty and snow-capped summits, in areas between the largest vapor-yielding surfaces, and its ultimate destination, or the point within the margin of the circles of frigidity wherein the continuance of vapour in an uncongealed or uncondensed state is *practically impossible*. Now, in the aspect of Nature displayed on the superficies of the earth, we behold a contrast between one quarter and another as to area of vaporization, and its reverse, or radiation of dry heat from land surfaces, and also as to the occurrence of summits inducing precipitation from impinging masses of air-borne vapour *en route* for the poles, as abounding in one quarter and wholly wanting in another. Delineate a hemisphere, for instance, according to Mercator's projection. Let the periphery of the sphere be delineated as having its margin in longitudes 170° west of Greenwich and 10° east. Here we have in the west the vast evaporating area of the Pacific, with scarce a point of attraction to precipitation between the tropics and Behring's Straits; while on the east we have the heat-radiating and non-evaporating surfaces of the continents of Europe and Africa, upon portions of which there are snow-clad summits inducing precipitation either by direct contact with impinging clouds, or by imparting the necessary chill to the atmosphere. The sequence of this contrast of circumstances, or conditions, is the transference of a vast volume of vapour, chiefly

raised in the tropical regions of the Pacific, to, and its precipitation and ultimate congelation in, Arctic regions, from which, where land-locked, there can be little or no waste by offshoot of icebergs. But no conditions tend to augment equally the ice accumulations north of the Atlantic, wherein icebergs, the offshoots of the Arctic glaciers, abound. Lieut. Parry estimated the weight of one such offshoot from the Polar ice, a berg aground in Baffin's Bay, to be 1,292,397,673 tons, being 4,169 yards long, by 3,689 yards broad, and 51 feet over water level. Another contained 900,000,000 cubic feet, and others of even vaster dimensions have been noted.

What aspect, then, may we expect these opposite segments of the arctic circle to present as the result of these varying conditions? In Behring's Straits the channel is choked by ice-floes, and shipping are in constant danger of being blocked in by ice as far south as 66° N. lat., while we have no record of open sea, even temporarily available for navigation, beyond four degrees north of this. But north of Spitzbergen an open sea to latitudes 82° to $84\frac{1}{2}^{\circ}$ has been many times recorded, and deer are said to thrive in Spitzbergen to latitude 80° , proof of a mild climate. Science, wrongly interpreting the fact of this open area of sea, has recently speculated on the probability of finding an open sea even to the pole. But although ice-girt seas in polar regions may be partially or wholly open as to their midst, that may arise from the fact that such areas have been ice-girt for centuries; and as the superficial stratum has remained in an almost stagnant state, exposed to a frosty atmosphere, and the fresher, and less dense molecules, rising to the surface, have been successively frozen, the residue of water is probably of an intense saltiness, resisting congelation even in extreme temperatures, in fact, in its lower depths a concentrated brine precipitating or crystallizing into massive rock salt. The occurrence of beds of this material may therefore be deemed *prima facie* evidence of the former occurrence of an arctic climate,—not merely a local glacial condition similar to that of Alpine summits,—in localities affording as yet no other evidences of this to the observation of geologists. Now, as to the accumulation of precipitated vapour, *en masse*, within arctic regions, and especially in the south-western quarter of the outer confines of frigidity around the arctic pole, north of which natural laws would prevent vapour being borne atmospherically, my views were, some years ago, opposed by the scientific critic, writing under the *nom de plume* of Œdipus. But research into observations by explorers of arctic regions, leaves no doubt of the fact, that accumulation

progresses for centuries under no natural condition of diminution, but by the offshoot of bergs, and their transference southwards by ocean currents. Local circumstances of thaw in the brief polar summer, though resulting in evaporation, yet only cause local rains, haze, or snow, rendering ice surfaces more glassy, reflective of solar rays, and impervious to wasting influences.

The Arctic voyager, Dr. Kane, remarks that "the Alpine glaciers have engrossed the field of scientific dissertation somewhat unduly. Those which crowd the western coast of Greenland have perhaps a higher interest, growing up as they do in a *climate which is independent of altitude*, besides being altogether superior in magnitude of scale." He defines the glacier to be "a mass of ice, derived from the atmosphere, sometimes abutting on the sea:" and he thus describes the Great, or Humboldt glacier. "This line of cliff rose in a solid glassy wall 300 feet above the water level, with an unknown unfathomable depth beneath it, and its curved face vanished *into unknown space*. The interior with which it communicated was an unsurveyed *mer de glace*, an *ice ocean* to the eye, of boundless dimensions. Greenland is in mass continental, having a length of more than 1,200 miles, not materially less than Australia from its north to its south cape. Imagine now the centre of such a continent occupied through nearly its whole extent by a deep unbroken sea of ice, that gathers perennial increase from the watershed of vast snow-covered mountains, and all the precipitation of the atmosphere upon its own surface. . . . You walked as over a terrestrial surface, met by every diversity of configuration, valleys, gorges, hills, plains, and precipices." Again, "the *mer de glace* which occupies the central plateau of Northumberland, is completely isolated and washed by the sea, and is necessarily dependent for its increments upon the atmospheric precipitation of a limited surface, yet it sustains in its discharge, no less than seven glaciers, one of which is half a mile in diameter by 200 feet in depth,—a startling instance of the redundancy of Arctic ice growth." "The circumstance of the glaciers' offcasts being so numerous seems to indicate a continuously protruding influence," doubtless from the superincumbent pressure of ever-increasing accumulation. Captain Sherard Osborne described the Antarctic ice barrier to be "the seaward edge of an enormous continental glacier." How can vapour precipitated and locally congealed upon accumulated piles of drifted ice floes, attain to the aspect of a continent? Dr. Maury observes, "To evaporate water

enough annually from the ocean to cover the earth on the average five feet deep ; to transfer it from one zone to another, . . . is one of the offices of the grand atmospheric machine. This water is evaporated principally from the torrid zone. Supposing it all to have come thence, we shall have encircling the earth a belt of ocean 3,000 miles in breadth, from which this atmosphere evaporates a layer of 16 feet in depth annually ; and to hoist up as high as the clouds, (convey polarly) and lower down again all the water in a lake 16 feet in depth, 3,000 miles broad and 24,000 miles long, is the yearly business of this invisible machinery." Maury further observes :—"The heating surface on the north side of the Equator within the torrid zone, yielding the largest evaporation, is twice as extensive as it is on the south side." We may, therefore, fairly assume that one-sixth of the whole of the water actually raised from this evaporating area is conveyed thence by the polar air current, and that a large proportion falls, and is congealed, in the western segment of the Arctic regions. In 1867 statistics were furnished of one snow-storm in the United States. The cloud covered an area of 1,500 miles by 300. The snow averaged one foot deep, and was estimated to weigh about five tons to the acre, or 3,200 tons to the square mile, or a grand total of 1,410,000,000 tons of snow. It must be an unreflecting mind that could contemplate such causes of accumulation without seeing that in course of centuries, if not *continuously*, a power or force must necessarily be evoked, controlling the position of the Earth as tilted or inclined on the plane of her orbit,—the extension of a radius, and deposit of dense material on its apex being mechanically capable of alteration of the centre of gravity of an equally poised sphere. Change of the Earth's centre of gravitation involves re-arrangement of her oceanic envelope, as regards the position of its surface level, over the whole area it occupies on the sphere. The sea recedes from some coasts to deepen upon others. This transference of volume I conceive to be the motive force raising the tide waves, being the naturally appointed mode of transmission of successive films of ocean surface (probably regulated as to their synchronism, or the maxima or minima of their elevation, by lunar attraction, but not necessarily caused thereby) from areas of redundancy, to re-adjust the equilibrium endangered by such change of centre of gravity. The circulatory movements of the diurnal tide-flow, inflex and reflex, probably check subverting tendencies, which might precipitate a catastrophe, or secular geological convulsion. Every cause

of change of density of portions of a sphere exquisitely adjusted as to equipoise, and having a fluid envelope, which must obey the laws of gravitation, (and therefore aid by its movement in accomplishing a definite change in the centre of gravity), must tend towards alteration of such centre. As in the toy, the water-clock, the passing of water from one compartment to another alters its centre of gravity, and causes it to tilt over, and revolve, so in regard to our globe, such causes as disruption on a large scale of ice barriers, and their drift to lower latitudes, or the transference of fluid matter in the bowels or crust of the earth from one compartment to another, or its decomposition and dissipation as gas or vapour; encroachment of the sea by earthquake breach, or subsequent to a long-continued elevation of sea surface, and its amassing within depressed areas of formerly dry lands; accumulation of ice, or sea water, as gravitating to a changed position; are each and all conditions demanding change of our globe's centre of gravity. Men of scientific renown, holding positions of authority as teachers of science, object to this idea that the necessary action of the rotation of the earth upon her axis is to accumulate a belt of watery volume upon her equator, and that this tendency of equatorial accumulation abrogates the action of all other natural laws demanding equable dispersion of sea volume in accordance with the laws of gravitation. It is a startling fact, after all that has been based upon it, and considering the long and disgraceful apathy of theologians as to this primary denial by science of the truth of the inspired Word of God, that *there is no absolute proof of the earth's rotation*, and even less proof of its revolution round the sun. The doctrine is but a feasible mode of accounting for apparent changes of position of heavenly bodies, deemed too vast to gravitate at varied focal distances to the centre of our little spot of earth. But "whether the earth be small or large in comparison with the remote bodies of the starry heavens is a matter of not the slightest moment. Value and excellence are not even with us estimated by magnitude; and no one would think of bringing into comparison, with a view to such estimation, the Kohinoor diamond and a block of granite;"* or the scene of the vicarious sacrifice of the Son of God, with the mass of combustible matter granted by the Almighty as a mere luminary. Incidentally the Word of God declares certain matters as to the subordinate conditions of the starry sphere, with reference

* Professor J. R. Young, in "Science and Scripture."

to this little globe, as inspired truths; and however adverse the mere hypotheses of scientific men may be as to these being matters of fact, we have, as believers in the Sacred Word, in absence of positive and incontestible proof of their error, no option, in due reverence of the Word and its Divine author—omniscient as to the works of Nature, as their sole Designer—but to receive such assertions as truths explainable in Nature, were we but adequately acquainted with it.*

Geologists hold, also, on the merest conjecture, that the earth was originally a mass of fluid matter in igneous fusion, which assumed its globular form in virtue of the mutual gravitation of its parts, and subsequently taking the form of an oblate spheroid in virtue of the centrifugal force attending its rotation. But may we not as reasonably conjecture it to have been a mass of *mud* propelled into space at the fiat of the Almighty Architect, and assuming a globular form by transmission from its matrix hither, as drops of melted lead are rounded into spherical shot by fall from a height. In the beginning, the inspired Word declares “the Earth was without form and void.” It is now the finished handiwork of the Almighty,—His work, perhaps the model for the after construction of vaster worlds, as imperfect as to fitness for residence by a human and intelligent creature,—rapidly progressing Godward, as our earth was at its beginning. The scientific problem has heretofore apparently been, in discarding the record of the inspired Word,—Given molten matter, a sufficiency of time, and asserted laws of Nature,—based on feasibility, not on absolute proof of their action,—to construct the crust of the earth as we now find it, without aid of a Deity. The great Sir Isaac Newton, though he submitted

* “The apparent phenomena of the heavens must be the same whether the latter complete an entire revolution from east to west in 24 hours, the earth remaining fixed, or whether the earth itself performs an entire revolution in the same time. This proposition is true if the transmission of light be instantaneous, however great the distance through which it has to pass. But if the velocity of light be not infinite, that is to say, if the rays take some perceptible time to travel to us from the stars, then the proposition does not hold good, as Arago has proved, by the following ingenious method of reasoning :—‘A star can only be seen in the horizon, or meridian, by means of those rays, which it emitted when actually in the prolongation of those planes.’ . . . But the determination of the velocity of light pre-supposes a knowledge of the true system of the world. The *fact* is, the apparent aberration of the stars, the reason being unknown to us, leads to the hypothesis of the translatory motion, or rotation of the earth. No instruments can be made of adequate delicacy to interpret to us the answer to the question by experiment on the earth.” *From the Rotation of the Earth*, by Henry Worms, F.R.A.S., F.G.S., &c., London, 1862.

the hypotheses of a fluid earth, evidently believed that it was originally a solid. In his *Optics*, page 378, he observes, "It seems probable to me that God in the beginning, formed matter in solid, massy, hard, impenetrable, movable particles, of such sizes, and figures, and with such proportions, and in such proportions to space as most conduces to the end for which He formed them. These hard and solid particles were variously associated in the first creation by the councils of an intelligent agent, for it became Him who created them, to set them in order; and if He did so, it is unphilosophical to seek any other origin of this world, or to pretend it might arise out of chaos, by the mere laws of Nature, though, being once formed, it may continue by those laws for many ages." The inspired Word states that "God divided the waters which were under the firmament from those above the firmament, and separated those below from the dry land, gathering the waters into seas, and causing the dry land to appear." There is therefore a measure of probability that the primary state of our globe was that of mud, or commingled earths and water,—none whatever that it was a molten mass, still in igneous fusion internally. If on due investigation of the reasoning submitted the theologian would but scrutinize the asserted theories of science, and, "proving all things, hold fast only such as are good," a firm stand-point might be gained, on a basis of truth, instead of on the assumptions presently rife, derogatory to the great Author of Nature, whose handiwork is practically denied daily. If the hypothesis of an igneous core, or central furnace in our globe be discarded as without proof in Nature, or the inspired history of creation, some other force in nature than volcanic upheavals on the grand scale must be searched for, to account for the movements of the waters of the globe, and their re-arrangement as to surface level, causing, as in the beginning, new lands to appear elevated above ocean surface, and the waters to be re-gathered into newly assigned positions. There is an utter inconsistency in the ideas set forth by the upheavalists, in that the same expansive force can be at once propelling and tractile in its influence on the crust of the earth. In Nature we have occasional evidence of petty local upheavals, and depressions, by volcanic agency, but as limited as to the superficies of the earth as the upburst spot of earth, the site of a school-boy's experiments upon a combination of sulphur and iron filings, is to the area of his playground.

Now, how does science, by its accredited teachers, *reason* upon these questions? One eminent geologist thus attempts to silence doubts upon them, by putting forth ideas, which,

notwithstanding that they may have been unhesitatingly accepted by science in former years, as the deductions from alleged facts, are now daily called in question as to their accuracy. He observes, "It has been well remarked that when two opposing explanations of extraordinary natural phenomena are given, one of a simple, and seemingly common-sense character, the other complex, and apparently absurd, it is almost always safer to adopt the apparently absurd, than the seemingly common-sense one !!!" Again, the same author remarks, "Common sense, in questions of natural science, is tantamount to common nonsense." Subsequently to this exposition, the eminent geologist we quote illustrates his meaning in a way that would "make angels weep," to observe Truth thrust aside, and the God-like powers of mind with which man is endowed, debased in supporting the merest conjectures in lieu of ascertained facts thus recklessly misinterpreted. He states it as "a well-established fact that while the medium level of the ocean is one of the most fixed lines in nature, the level of the great continents, with their table lands and mountains, is an ever-fluctuating line. It may seem strange," he remarks, "that land should be less stable than water. We see the tide rising and falling twice every twenty-four hours, and the rock ever remaining in its place; we speak of the fixed earth and the unstable sea; and yet, while we have no evidence whatever that the sea level has changed during the ages of the tertiary formation, and absolutely know that it could not have varied more than a few yards, or at most a few fathoms, we have direct evidence that, during that time, great mountain chains, many thousand feet in height, such as the Alps, have arisen from the bottom of the ocean, and that great continents have sunk beneath it and disappeared. The larger part of Northern Europe and America have been covered by the sea since our present group of shells began to exist. . . . On the Indian coast" (during the Chilian earthquake of 1822) "the sea seemed to be rising at nearly the same time when it appeared to be falling on the American one; and on the latter such was the actual impression entertained by the people—'it was the general belief of the fishermen and inhabitants, *not* that the land had risen, but that the ocean had permanently retreated.' But if it had retreated from the Chilian shore, how could it have risen on the Indian one? In like manner the sea appears to be receding from the shores of Sweden at the rate of nearly four vertical feet in the century, while it seems to be advancing on the western coasts of Greenland

at, apparently, a rate more considerable. . . . All the time, however, the actual motion—upwards in one region, downwards in another—is in the solid earth, not in the sea, which merely serves as a kind of hydrostatic *level* to indicate the fact of subsidence or elevation of the land.”* Shade of the illustrious Newton! must we acquiesce in such monstrous fallacies, and tacitly aid in trampling upon Truth thus ruthlessly hurled from its pinnacle, despite the evidence of facts in Nature pointing to totally opposite conclusions, if science would but read them intelligently? Such hypotheses as the foregoing are but “oppositions of science, falsely so called;” to be repudiated, with wonder that such could ever be advanced by the late Hugh Miller, or acquiesced in by contemporary geologists. The style of *reasoning* reminds one of that of the inebriate laird, who, after vain attempts to preserve his equilibrium in the saddle, succumbed to a sudden lurch in crossing a ford, and became a squatter in the stream. Hearing the splash, perhaps, but oblivious as to his change of position, apparently, he hailed his servant with “Wattie, my man, there’s something fallen in the burn.” To which that worthy replied, judging from appearances, like the Chilian fisherman, “I’m thinking, laird, its yoursel’.” The inebriate,—like the geologist, who ignores the principles of mechanical philosophy, blind to the results of a loss of equilibrium in moveable matter, in redistribution of its volume in accordance with the natural law of gravitation, could not see the matter in that light, remarking, “How can it be me, when I’m here?” How could the margin of the ocean rise on the Indian shores, asks the geologist, though appearing to recede from those of Chili? The surface of the ocean is, he tells us, inflexibly level, and merely indicates elevation or depression of the land! Such is the crumbling foundation upon which much of what is termed scientific geology has been reared, inducing an ever-extending series of assumptions as to formations of strata, and ages of fossils, and other relics of organisms therein embedded, involving the assumed antiquity of man as coeval with mam-malia now extinct, which will not bear exhaustive scrutiny as to being based on facts, and are therefore unworthy of the name of philosophy. Of the influence the disrupting and drifting agency of water may have in conveyance and deposition of commingled earthy matters and organisms, brought together fortuitously, and not as having local and contemporary origin, instances will be submitted in a second chapter.

* “Testimony of the Rocks,” lecture on the Deluge, by Hugh Miller.

CHAPTER II.

CONTENTS.—Theory of central heat, causing upheavals, combatted—Results of a loss of equilibrium by the Earth, as to change of position of sites of defined latitude and longitude—Theories of the Precession of the Equinoxes, and of the Tides, and a new interpretation of these phenomena—Recession of the sea from coasts, *not* a silting up of their harbours—Hypothesis as to age of the Pyramids, and intention of the coffer in the King's Chamber—New views as to age of the "cave-men"—Hypothesis as to drifts and deposits therefrom—Questions important to the mercantile marine and navy.

THE theory of igneous upheavals of portions of the earth's crust, of continental area, is still maintained by some geologists, and palæontologists, to account for the apparent elevation of lands above sea surfaces. This theory is based upon the mere assumption that the primary state of the globe was that of a mass of molten and incandescent matter, and that this seething mass, though cooled and hardened into a crust externally, still exists beneath this crust, not only ready for volcanic action, but actually and simultaneously upheaving and depressing continuously segments of the earth's crust at the present day, so that lands are raised and depressed, as to the level of the seas upon their coasts, while the sea ever retains a "fixed hydrostatic surface level." There is, however, absolutely no proof of this igneous theory, nor any corroborating fact, but that in localities—possibly areas of exceptional volcanic or chemical affinities—an increase of heat, registered by thermometers sunk within borings, has been noted at successive depths. But heat, so tested, might result from disengagement of latent caloric during the friction of the tools used in boring. The result of a boring more recently undertaken at St. Louis, U. S., to a depth exceeding 3,840 feet, contravenes the accuracy of the data assumed from earlier experiments, of a relatively proportionate increase of temperature at successive depths from the surface, and points to similar conclusions to those deduced from deep sea soundings, that, most probably, a fixed low temperature is attained at great depths, and prevails even equatorially. That a gradual increase of heat at descending depths is not the experience of practical miners, may be inferred by the fact, that the assumed proportionate increase of heat, from the mean quantity deduced by earlier experiments, of 87° at the depth of 1740 feet, has not militated against the working of the deeper coal mines, by natives of a cool climate. The Rose coal mine at Ince, near Wigan, possesses the deepest known shaft in the world, yet is short of half a mile in depth. Poor puny finite man, what data hast thou for authoritative assumptions as to the internal structure of a globe of which thou canst as yet but scratch the

rind of? only having penetrated in some few localities to a depth of one-six or eight-thousandth part of the radius from centre to surface. By perpetuation of the crude hypotheses, current among geologists, that the disrupted aspect of mountain chains, as well as the alternate elevation and depression of vast areas of the earth's surface, are the result of mysterious movements of an incandescent mass beneath its crust, necessity for investigation as to principles of causation is practically denied. But the earnest student of physics, and investigator of the agencies in nature effecting terrestrial changes, as well those of the position or inclination of the earth's poles, to the actual or assumed plane of her orbit, as of the waste, renovation, or alteration of aspect of her external crust, must scrutinize even *accepted* theories, and absolutely reject every assumption unbased on veritable facts. "Prove *all* things, hold fast that which is good," should be the motto of the scientific investigator. More especially, no theologian, or recognized orthodox preacher, should accept as undoubted scientific truth, assumptions based on conjectural data, affecting, by a hair's breath, the strict veracity and accurate statement of fact contained in the inspired Word, whose Divine Author is at once the Architect and Almighty Controller of Nature, and who doeth according to His will throughout the vast universe, yet probably by operation of designed natural laws effecting predetermined sequences.

Mallet observes that "an earthquake, however great, is incapable of producing any permanent elevation or depression of land whatever, unless as secondary effects. Its functions of elevation and depression are limited solely to the sudden rise, and as immediate fall, of that limited portion of the surface through which the great wave is passing momentarily." I submit that the phenomena of earthquakes may be but notifications in nature of effectuation of a change—of exceptional energy—in the earth's centre of gravity. At sea, earthquakes cause apparently a shock of vertical impulse to the superincumbent oceanic surface, uplifting and throwing off a wave, or film of volume, directed by the course of impulse, or the tend of the change thus being effected; the usually noticed primary action upon surrounding coast lines, —the receding wave, being probably caused by the rush of water to fill the vacuum, or depression of surface, resulting from the ejection of the wave of impulse, prior to the reflex of the succeeding waves, of devastating characteristics. In noted phenomena of the past occurrence of earthquake waves, there is presumptive evidence in favour of a con-

tinuous progression of change of the earth's centre of gravity in one general direction, augmenting, by impulse to transfer of oceanic volume, the condition involving such change. But if the oceanic envelop must inevitably, in obedience to the natural law of gravitation, transfer portions of its volume from the coasts of the Southern hemisphere, and the eastern half of the Northern hemisphere, to accumulate in the Northern Pacific, as scientific observation proves to be the actual fact, we have *à priori* testimony to actual sequences of the force thus evoked. And when we find in nature existence of a semi-diurnal wave of transmission of successive films of water in course of such transfer, and the flex and reflex of said waves, from impingement on opposing coasts, affords a marked general coincidence of action with what, on scientific principles, we must deem necessary action under influence of exciting force, and in effect restraining subverting tendencies of the loss of equilibrium evoked, we perceive evidence of an All-wise design, and conceive that the exciting cause of the oceanic tides is, in this way, more rationally accounted for than by the popular theory, (regarded by the Astronomer-Royal of England as "contemptible") of referring the cause to planetary, or solar attraction, upon an wholly imaginary (coined for the purpose) belt of accumulated waters within the tropics. Change in the centre of gravity, is by mechanical law, change of line of axis, and perpendiculars thereto, with all their parallels, termed, as regards our earth, degrees of longitude and latitude. It is currently asserted by astronomers that such changes are physically impossible; that the rotatory motion of the earth accumulates, or has accumulated, a tropical enlargement, or band of the originally molten matter, and that this regulates her equilibrium as to her position in space while performing her mighty revolutions, daily upon her axis, and yearly around the sun, and by now amassing waters equatorially, prevents their gravitation elsewhere. But, as yet, science only adduces these as plausible hypotheses, for there is *no one absolute proof* of either the axial or orbital revolutions, and many facts in nature cast doubt as to the fact. The moot points as to the sun's distance, and the actual time, if any, required for transmission of light, and as to what stellar bodies are dependent on our, or other suns, for light, rendering them luminous to us, if ever satisfactorily resolved by science, may be revolutionary in effect upon the hypotheses of to-day. Our little globe—the initial stand-point, perhaps, of a new creation of intelligent beings, and of preparation of stellar worlds for their future homes, and progressive

advancement Godward—may yet prove to be the central point around which a universe revolves in circles or ellipses with varied focal distances, and the *impulse of attraction* binding stellar worlds thereto—electric current, or whatsoever it may be, may perchance afford the concentrating *force* of gravitation, as acting terrestrially by evident natural law, the *nature* of which impulse is as yet dark to science. But I must apologise for this digression. Expression of honest doubt of truth of hypotheses, built upon assumptions, may induce deep thinkers to investigate alleged facts in science, and, if these are *unproved*, search out a true basis of theory. The observations to set at rest the Sun's distance, taken in connection with the recent transit of Venus, may be marred as to accuracy, by apparently wrong definitions of the longitude of the observing stand-points,—a check to accuracy in *all* previously noted observations. At the March meeting, a few years ago, of the Royal Geographical Society, it was stated, that observations during recent South Sea explorations had conclusively proved that all the recorded nautical positions defined by Morrell, in his Four Voyages to the Antarctic, were entirely untrustworthy. And it is a singular confirmation of the theory I submit of the deflection south-westerly of the Arctic polar apex, and opposite indication consequently of the Antarctic extremity, to find seven years after I first published my ideas, that Sydney is discovered by the Admiralty to be some distance west of its assigned degree of longitude, and it is also affirmed of the 141° of East longitude, defined in 1849 as having a stated and land-marked position, that it is now encroaching easterly within the confines of Victoria. In other words, the Sun's period of attaining meridian altitude has apparently been protracted since the observations were made, whereon the definition of the locality of the 141° of East longitude was computed twenty-five years ago.

It has been erroneously stated that my views are those set forth by M. Adhémar, a French mathematician, and author of scientific repute, and his pupils. But I claim to have traced the links of a chain of natural operations, till view of the consummation broke upon me ; and subsequently I found that Adhémar had promulgated somewhat similar ideas. In one important point *I wholly differ from M. Adhémar*, who holds that the declension of climate caused by excess of the period of winter in either hemisphere alternately, during half the period assumed by Astronomy, as requisite for a revolution of the ecliptic, or some twenty-six thousand years, results in disproportionate polar ice accumulation ; and ultimately the

leverage of this, on end of an extended radius, acting on the centre of gravity of the fluid sphere, or oceanic envelop of the globe, causes such centre to become eccentric from that of the solid sphere, and thus accomplishes a physical convulsion, and change of place of the oceans and continents, with a primary devastating flood or deluge. I hold that the equilibrium of the globe as poised in space, is so finely adjusted (by Him "who weighs the mountains in scales and the hills in a balance"), that its centre of gravity is susceptible of change, by occurrence of the varied natural phenomena previously denoted, including alterations in density of sections of the material of the earth, arising from chemical affinities of contained matter inducing combustion, gaseous emanation, or combinations in new forms; passage of fluids—molten rock, water, &c.—from internal compartments to others; displacement—catastrophically by earthquake, or placidly by the constant tide wave, continuously transferring films of oceanic volume, and its amassing in certain areas; as well as by the disproportionate accumulation of congealed matter at either pole. In a rotatory spheroid, change of centre of gravity is necessarily by mechanical *law*, change of axis. But leverage of an extension of radius, by a weight of material on its extremity, is in itself a *force* capable of re-adjustment of the position of the sphere as regards her inclination or tilt. Hence ensues a movement altering relative positions of any given points of defined longitude on the earth's contour with reference to their meridional angles of intersection of the plane of the ecliptic. Hence I submit that precession of the equinoxes is the *sequence*, and in no way the *cause* of polar accumulations; and hence that no calculation of a period of revolution of the ecliptic can be based upon hypotheses of that being a primary movement, which is but a sequence of a force dependent on natural laws, constantly operating, but with variable intensity.

The phenomena termed the precession of the equinoxes is stated by astronomy, to consist in a minute annual decrease in the time occupied by the sun in reaching the several points or meridians of longitude marking one complete revolution, while there is an apparent increase of longitude in the position of celestial orbs in relation to the extension towards space of the polar axis. Astronomers account for this by certain abstruse hypotheses, apparently supported by mathematical demonstrations, though based on merely conjectural data of fanciful amounts of perturbing influences of the sun, moon, or planets. These bodies while moving through space in view of the earth, are assumed to be so

affected by her (imaginery) girdle of redundant matter around her equatorial waist, that they cannot permit her to pursue the even tenor of her way, either rotatorily, or in her orbit, without exercising their imaginarily attractive powers thereupon. This purely fanciful idea may, however, be driven into the shade, in view of the mechanical necessity for causes of terrestrial origin affecting the earth's equilibrium, inducing change of its centre of gravity, not once in ages as conjectured by M. Adhémar, but continuously. Polar accumulation, when of vastly disproportionate amount upon one segment of the Arctic circle, is one adequate cause, aided, the effect maintained, and the amount definitely registered in sight of science, by the continuous transfer of the fluid envelope of the globe, resulting in relative elevation and depression of all coast lines with reference to adjacent sea surfaces. Barometric observations of relative altitudes of sea surfaces at prolonged intervals, by an instrument of extreme nicety, having a gnomon of extended radius, or being otherwise specially adapted for the purpose, would test the accuracy of the data upon which I base my theory as to the continuous increase of the changes heretofore recorded. The initial points of longitude being represented by defined positions of observatories at European capitals, the westerly deviation of the northern apex of the polar axis has not yet been definitely traced, the astronomically conjectured causes affecting precession of the equinoxes being held to account for the annual change computed in the obliquity of the angle of intersection of the plane of the equator—which must ever be perpendicular to the axis—with the plane of the earth's orbit. It rests with science in the southern hemisphere to follow up the solution of this great problem. If the northern apex of the polar axis deviate south-westerly, there must be variations in the angle of intersection of the plane of the ecliptic (which I submit is the phenomena of precession), and a deflection north-easterly of the antarctic axial extremity, causing an easterly change of position of southern longitudes with reference to previously defined points on the earth's surface.

That there are still difficulties to be got over by hypotheses of action of natural phenomena as to the cause, and results of continuance of the precession of the equinoxes, as popularly explained by astronomy, may be inferred from the subjoined extract from a paper laid before the Royal Astronomical Society, by Colonel Drayson, F.R.A.S., a few years ago:—"For many years it has been accepted, without question, that the pole of the ecliptic was the centre of the

circle traced in the heavens by the pole of the heavens. Consequently, the actual course of the pole could be traced out, and we could prophesy where the pole would be at any date in the future, and could state where it was in the past. Geometry, however, is a science which admits of no contradiction ; all must be in harmony, or else some part must be in error. By a geometrical investigation of this problem, it can be shown that, if the pole of the ecliptic were the centre of the circle traced by the pole of the heavens, these two poles must of necessity remain always at the same distance from each other. But it is a geometrical axiom that the distance in degrees between these two poles is the measure of the angle between the planes of the ecliptic and the equinoctial. Consequently, if the angle between these two planes is found to vary, it follows that the pole of the ecliptic is not the centre of the circle traced by the pole of the heavens. The recorded observations of the past 1,500 years prove that there is a gradual decrease in the angle between the planes referred to, consequently, under such conditions, it is impossible that the true centre of the circle can be the pole of the ecliptic.

. . . The proper motion of the fixed stars, and the moon's changeable rate, as indicated by eclipses, are problems affected by this discovery, as are also various other important facts. . . . The period when the pole traced its circle does not seem to be at present known by astronomers. At present, astronomers merely subtract a certain value from year to year in order to obtain the value of the obliquity for the future. Considering that we have had no real original fact brought forward in geometrical astronomy during the past 100 years, this problem is one which must attract the attention of all astronomers." Its exhaustive investigation may pave the way for admission of the discovery I have submitted, superseding efforts to define specific annual results of a cause of variable intensity. The longer continuance of solar rays upon the arctic than upon the antarctic apex of the earth's contour, affords annually an extension of season favourable to precipitation of snow beyond that afforded in the antarctic,—snow storms being induced by a milder temperature than that of intense congelation, hence a relatively greater accumulation in arctic regions. Whether this cause augments the effect or not, certain it is that the sea is amassing in the North Pacific, and on West Greenland, while receding,—its volume shallowing, upon the coasts throughout the Southern Hemisphere, and upon the shores of Europe, where the lands appear to be gradually elevat-

ing and removing inland from sea margins, except in a few localities, where, from action of the tide-ripple, or the surface waves, readily-breached formations are undermined, and the sea advances on portions of the land; though actually shallowing on the same coast, and the rock sea bottom rising to view. This phenomenon is constantly presented to our notice on Victorian coasts, but is referred, by shallow reasoners, and non-observers, to "silting up" of harbours, &c., and an imaginary progressive growth or *elevation* of the land. The test question to be answered is this. Be the land rising, or the sea receding, and leaving the land, where does the water go? We may note a most remarkable change of aspect on the shores of Port Phillip within the last fifteen or twenty years. The sands are denuded from the bed rocks at bottom at all points subject to shallow wave action. The rocks disclosed have sharp, unwater-worn points, and angles, when first bared, proving them to have been long protected from littoral tide action by a coating of sands. The sand is amassing itself in hummocks above the reach of high water. This is no "silting up" of sea bottom; and again I ask those who glibly condemn new ideas based on deep researches in Nature, and assert that the "land is rising throughout Australasia, and that these are common changes, and easily understood,"* Where does the water, formerly of noted depths, but now greatly shallowed, recede; to and how, and by what natural laws does it maintain a spherical outline elsewhere on the globe's exterior, if so "easily understood"? and not subject to gravitation to an altering centre of gravity, maintained, and aided also, as I submit, by this movement of oceanic volume, which researches in nature prove to be accumulating in the North Pacific, while diminishing elsewhere throughout the world. We may, however, feasibly conclude that the earth's centre of gravity is shifting northerly, and that ice accumulation in *Arctic* regions is greatly disproportionate to that of the Antarctic, which wastes by numerous bergs cast off annually, which are more and more frequently met with in comparatively low latitudes, and probably by their presence within a few hundred miles of the Australian coast, give rise to the cloud masses which unseasonably chill our summers, and oftentimes deluge us with their aqueous contents. The central point of arctic cold is ascertained to be considerably south-west of the astronomically assumed position of the arctic pole, and if precipitation and congelation, without

* Professor McCoy.

waste, by offcast of bergs, largely predominate in the region north of latitude 66° at Behring's Straits, while to latitude 84° north of Spitzbergen, areas of clear sea are noted, and the North Atlantic and North Sea abound in ice-bergs, the central point of the ice continent, that is the actual centre of the circle of frigidity, within Arctic polar regions, must be south-westerly, as assumed scientifically on different data to those I submit as the cause, from the assumed astronomical position of the Pole.

In the present state of science the reasons inducing the construction of those stupendous marvels of ancient times, the Pyramids, are not perceived. The great Pyramid of Ghizeh, built of solid blocks of stone into a dense mass, and dovetailed into solid rock, is only accredited as the tomb of some Egyptian monarch, at a date long subsequent to that of Noah's Deluge. I conceive it to have been erected for a wholly different purpose, and *prior* to that catastrophe. In the narrative of Piazzi Smith (Astronomer Royal for Scotland) of his exploration of the Great Pyramid, it is stated that "in and upon the coffer there is not a shadow of carving, painting, or writing, as there would have been upon a sarcophagus, and there is no lid. From considerations of its size, and proportions to the chamber and the Pyramid, it cannot be other than the original *vessel for which the chamber was anciently built*. . . . It has a distinct reference in its size and cubic contents to the capacity and density of the matter contained in the crust of the earth, and it is only by physical science, rightly applied, that this ancient and weighty message of old to the present day can be read." Since the construction of this Pyramid, some force other than atmospheric action and rains has levelled beneath the surface surrounding the edifice the vast piles of debris consequent on the builders' operations. "The excavated material is not to be found. The building seems as if dropped from heaven in a perfect state." I have submitted that this Pyramid is one of those built, according to Josephus, by the descendants of Seth, son of Adam, to record their discoveries in physical science, and that the purpose of the solidly constructed Pyramid, and of its coffer, and accurately proportioned markings of the chiselled stones of vast dimensions forming the walls of the coffer chamber, was to investigate and note the changes, in constancy of relative position, of the polar axis, and deviations of the earth's centre of gravity, as indicated after long lapses of time, by an alteration of the surface level of water, when placed in the coffer, with reference to the finely adjusted horizontality of the

huge 30 feet long and 90 tons weight blocks of stone when first placed in the walls of the chamber. And I submit that records of the domestic life of ancient Egyptians, as also of the prediluvian inhabitants of the American continent, and their progress in other arts than revealed by sculptures, and paintings on their edifices, is to be found by exhumation of entombed relics, as done in the case of Herculaneum and Pompeii, from beneath the loam covering, or diluvium deposited by the Flood. The depth of necessary excavation cannot be great, not probably beneath the level of the lower part of the Sphinx. Already minor explorations have revealed various relics, pottery, &c., at depths of from thirty to sixty feet. But the upward pressure of water-springs throughout the Valley of the Nile renders the task there difficult.

What would be the result to our present race of man in his highest state of civilization, progress in arts and inventions, if prophetic allusions to "the end being with a flood and desolations," which "they that escape shall flee from to the mountains," were to turn out to be *literal truths*, and some sudden catastrophic influence caused loss of equilibrium to our globe? Natural law would impel her to seek to regain it after the convulsing primary shock, and she might "reel to and fro," or slightly oscillate, sending her ocean waters in vast tidal waves over continents. Still there might be time to flee to the mountain tops, and a small remnant of our race might be saved thereon, sheltering in caves and rugged hollows.* Would they, in their hasty flight, take up with them proofs of their progress in art, and supplies of useful implements? No! it would be a rush for dear life only.† For days, and perhaps weeks, these unfortunates, like shipwrecked mariners, would wander over the tops of the mountains, now become islands, foraging for food. Carcasses of drowned animals would be drifted ashore by the swelling flood—some, borne from distant points of the earth's contour, are as unknown to them as animals existing now on the Antarctic continent (with a race of man perhaps thus saved, as in many people's traditions) are undreamed of by us—or, if ever heard of, as former denizens of some spots from whence their carcasses have drifted, or have been deposited, till disclosed by geology, are deemed by paleontological science as only of ancient type, and now wholly extinct—still, want of other food renders their flesh acceptable, and happy those who can make fires to cook such

* Revelations vi. 15.

† Matthew xxiv. 17-24.

food. Breaking the bones for the marrow, modelling fragments of bone into needles to repair garments with sinews, as our natives used to do; making stone axes and spear heads; and indulging in such recreations as carving bones, or scratching the cavern walls with drawings of animals coming to their recollection, would be employments resorted to by the most cultivated of mankind, if thus bereft of all advantages of civilization. And yet the science of our day ignores occurrence of such floods as Noah's, and asserts that the "cave man" was necessarily a pre-Adamite, or pre-historic resident on the earth, ages before the Word of God testifies to his creation. Much of what is asserted by paleontology as to age of drifts, period of their deposition, antiquity of organisms found therein, and the certainty as to their species being extinct, and the connection between deposit of such drifts and disintegration of gold-bearing formations, is as utterly devoid of any sure basis of scientific truth. We are as yet but on the threshold of scientific knowledge. Pity it is when our teachers shut to the door of access to it by asserting their own knowledge or assumptions, as all that is necessary; and imperatively demand that the student adopt their hypotheses as scientific facts necessary to entitle him to a diploma, or license, as a mining surveyor, &c. In the Mosaic history of the flood, it is said to have abated "in going and returning," implying ebb and flow of tidal waves. The oscillatory motion may have prevailed throughout the whole phenomena of the deluge, and the points of highest mountains have afforded safety to families of man, the nuclei of subsequent nations. Other individuals—the cave-men of the deluge—may have existed in safety for a time, but as the flood rose higher and higher, their place of refuge may have been submerged, and by subsequent deposition of loam, when the troubled waters precipitated the earthly matters held in mechanical solution, the entrances to the caves may have been entombed, until disclosed now to the investigations of the palaeontologist, and used by him as a foundation for very erroneous reasonings; in every important point hurling defiance to the simple narrations of fact vouchsafed to man in the Scriptures, penned by inspiration from the Designer, and primeval Architect of Nature in all her aspects.

Geologists maintain that the local discovery of accumulated bones and teeth of mammoths and other extinct animals prove that these formerly existed in extraordinary abundance in Britain; and yet the vastness of these accumulations militates against such an hypothesis, and suggests

that deposit to have originated in the drift from a deluge. Again it is affirmed that fossils and flint implements have been found associated with the bones of an ancient type of mammalia, including the cave hyena, the cave tiger, the hippopotamus, and the elephant. But the occurrence of the Noachian deluge, if regarded as brought about by a change of the earth's centre of gravity, when the oceans would yield to the temporary oscillation produced, and suddenly overflow lands with desolating force, would account for all noted disintegration, drift, commingling, and ultimate deposit of the fossiliferous debris of strata of ancient type, with relics of the then existing creation. In Derbyshire, plates of smelted copper and relics of art made of slate, stone, bone, bronze, and pottery have been discovered, in caves. In caves in Devonshire, the first floor consists of boulders, then black clay, then stalagmite, or stony breccia, then cave earth, embedded in which, to several feet in depth, are bones of now extinct animals. Above these are found terrestrial and marine shells. In other caves, marrow bones, broken by man, and bearing marks of knives, lie with bones of beasts of prey.

Hitherto, although large sums have been, at various times, expended in the cause of scientific discovery within Arctic regions, exploration of the Antarctic shores has been strangely neglected by science. There is every probability that a race of man may *exist* there, whose traditions of their origin, or salvation through an overwhelming deluge, might confirm those of many other parts of the world. And, probably, relics of the last great overflow of the habitable parts of the world, by waves in the direction denoted by deposits of diluvium, or from north to south, may be readily available to search along the shores from which the icebergs break off the enveloping ice at certain seasons. It was thus the wondrous deposits of elephant tusks and mammoth bones—the supply to the manufactories of the world during the last century—were discovered amidst the regions of hyperborean oblivion, as fresh, and in such good state of preservation as if natural decay was unknown there. No relics of man, however, are reported; and this is negatively corroborative of the Scriptural account of the period of man's advent on the earth. The Antarctic shores may teem with the debris swept off the northern continents during Noah's flood. The disclosures of geology as to the strange association of beasts of prey with refugees of mankind, temporarily seeking shelter from the elements, in caves of the mountains, is but a counterpart of the narration of unimpeachable travellers on the South American prairies, as to the occa-

sional enforced fraternization during local inundations, and prairie conflagrations, of wild animals, such as bears, pumas, jaguars, &c., with deer and other ruminants, and man, upon isolated spots of apparent safety. Beasts of prey, driven from their dens by hunger, would seek along the diminishing shores of their rugged fastnesses for carcasses of drowned animals, and the gnawed bones of such as drifted within their reach would be left to transmit to future ages collateral evidence to the truth of the wondrous tale, recorded in Scripture, that at one period since the advent of man upon the earth, the waters rose to the tops of the mountains. Icebergs are stated to have been met with interstratified with soil containing mammoth and other bones. The stranding of a whale ship upon such a berg is not an impossible contingency, for facts are on record of abandoned ice-bound ships, loosed by the annual break-up of the ice floes, being drifted off amongst ice attached to a floating berg. Carried into lower latitudes by the polar currents conveying streams of dense and gelid water to replace the waste caused by the vast evaporation from sea surfaces in the tropics, the berg might ground upon any coast line, and gradually melt and disappear, leaving local evidences, similar to those now relied on by geologists, of association of man's remains, or relics of his handicraft, with bones of ruminants and other animals long deemed extinct upon such shores, to prove the vast antiquity of man beyond the period assigned by Holy Scripture. What wonder is it to find traces alleged to conflict with Scriptural truth on such subjects—of results of successive landslips, undermined from lands exposed to the raging waves and overwhelming torrents of a displaced ocean; causing the disintegration of sedimentary strata; or, excavation of vast ravines, gorges, and valleys; with any deposit therein of the heterogeneous contents of the then chaotic confusion of materials, riven from the solid crust of the earth? What wonder is it when forests of fir, beach, and oak are disclosed as successively deposited in substrata of a country not now producing such varieties of timber? What wonder is it to find beneath such layers of drift, that—as with gold drifts—substances of great specific gravity, such as flint implements, have sunk to the lowest stratum of the mechanically-commingled earthy debris of the “mud of great waters”? is not the agency of irrupted oceans seeking to re-arrange their volume in conformity with the law of gravitation, and oscillating in vast tidal waves over the face of the earth, adequate to accomplish, by the one catastrophe of Noah's Flood, much that geologists represent as the work

of nature during countless ages, under the uniform action of minor agencies?

For the accuracy of the views now submitted we have the analogies presented in the Sacred prophecies, the records of previsions accorded to the inspired writers by the Great Author of Nature, as to events in the future of our earth's destinies, when "the end shall be with a flood and desolation," "and there shall be rivers and streams of water on the top of every high mountain, and every high hill," which "they that escape shall be upon the mountains," fleeing to the dens and the tops of the rugged rocks, when "the earth shall reel to and fro like a drunkard," and shall be "overturned," or "turned upside down," and the stars appear to fall from heaven, all being the changes symptomatic of the earth's loss of equilibrium, and change of position, as inclined upon the plane of her orbit; and the disruption of her oceanic envelope, as to its previous barriers, or land-locked limits. As to discoveries of ancient beaches, with accumulated banks of remains of shell fish, interspersed with human relics, in various maritime countries of Europe, is it any wonder that the oceanic envelope, if formerly concentrated to a different centre of gravity, should have stood higher on some coast lines, or lower on others, than now? How otherwise could it obey the imperative natural law of terrestrial gravitation? And as regards the kind of natural classification of drifted materials shown in the heaping up of the lighter portions of shells, bones, &c., of the "kitchen middens" of the Danish coasts, what is it but analogous to what we observe on our own coasts, where action of the surf or waves sometimes separate the shingle, shells, yellow sand, black sand, sea foam, sea weeds, and bulkier particles of drift, from combination with each other, and deposits each, even to each kind of shell sometimes, in distinct banks or layers. The laws regulating such separation, drift, and aggregated deposit of varied materials, of little relative difference as to specific gravity, may not be clear to us, and are probably those relating to shore currents, which, on the larger scale of the incoming rush of the waves of a deluge, would classify and accumulate the triturated debris, washed from many lands, on coast lines, as now on the lesser scale above noted. There is much that is as yet unintelligible to us, even as to the movements of the rippling wavelets, as they gently lap the sandy beach on the calmest day. How comes it that in some cases the marginal sands are eroded even up to the cliffs, and elsewhere accumulated? Some areas of sand are washed smooth and flat, others are indented

with ripple marks, while others again are raised in little mounds, with intervening hollows? Whence arise these changes in arrangement of what is to all appearance the same material, under the apparently uniform action of the gentle ripple of the advancing tide of a placid sea?

“Most of the sea-port towns of Great Britain and Ireland are built on a flat terrace of unequal breadth, which runs around the shores, backed by an escarpment of varied height and character, which is known to geologists as the old-coast line. No geologist can or does doubt that this escarpment was at one time the coast-line of the island—the line against which the waves broke at high water in some distant age, when either the sea stood from twenty to thirty feet higher along our shores than it does now, or the land sat from twenty to thirty feet lower.” . . . “Shells, not now British, are found in many parts of Britain at heights varying from 200 to 1,400 feet over the existing sea level.” . . . “The table lands of the country were submerged in a sub-arctic sea, and Great Britain existed as but a scattered archipelago of wintry islands.”*

“Nearly the whole of England would be under water, with, however, a few islands representing the higher peaks of Cornwall; others scattered over the site of the West Riding of Yorkshire; and a hilly tract of land over what is now Wales. A thick set archipelago would represent the Cheviot Hills, and the country south of the Forth and Clyde; north of which would intervene a broad strait, with a comparatively large area of undulating land beyond, stretching across what is now the area of the Grampian Hills, in Scotland.”†

In Dr. Lardner's “Popular Geology” there are diagrams of the supposed relative positions of land and water upon the continent of Europe and the British Isles during successive geological epochs, taken chiefly from the maps of M. Elie de Beaumont and M. D'Orbigny. The epochal variations are too numerous to be quoted. The evidence furnished by the sedimentary formations upon which the charts are based demonstrate that “the geological convulsions which took place between period and period, completely deranged the successively pre-existing outlines of land and water. One fact in the illustration may be noted, viz., that entire mountains in the Pyrenean chain are almost wholly composed of the fossiliferous remains of a minute conchiferous

* “Testimony of the Rocks.”

† “Gleanings from the Note-Book of a Field Geologist,” by A. Geikie, Esq.

animal, designated *nummulites planolata*, whose habitat, during existence, must have been remote from the coast, at the bottom of a deep sea. It is a striking fact, also, that it was of like materials that the pyramids of Egypt were built."

Fossils found in sedimentary formations in England, prove that at one epoch of cataclysmal revolution, elephants, rhinoceroses, and other monstrous land animals were deposited amid pine forests, over which, when at a subsequent epoch submerged, an accumulation of the carcasses of whales, nar-whals, and sea-horses, swept by oceanic overflow, were arrested, and fossilized, amidst the new sediment of another convulsion of nature, resulting in addition of their remains, entombed in an earthy deposit, to the continuously augmenting strata. "Belemnites, fossils of the oolite, have been dug out of the sides of the Himalaya mountains 17,000 feet over the level of the sea." "It is clear that all rocks which were formed at the bottom of the sea, and which are now dry land, must have gained their present situation either by the sinking of the sea level, or by the uplifting of the sea bottom. We find aqueous rocks on the summits of some of our highest mountains; and if these had been laid dry solely by the sinking of the sea, it is difficult to understand what can have become of a shell of water ten or twenty thousand feet deep enveloping the whole globe," unless, by change in the earth's centre of gravity, this was elsewhere equably disposed around the new centre. Sir C. Lyell remarks, "Geology demonstrates that the persistency of subterranean movements in one direction has not been perpetual throughout all past time. There have been great oscillations of level, by which a surface of dry land has been submerged to a depth of several thousand feet, and then, at a period long subsequent, raised again, and made to emerge." Why must we longer ransack Nature in search of powers of igneous elevations, co-extensive with a hemisphere, when the hypothesis of change of centre of gravity furnishes a solution to the problem? Why? Because, as La Place remarked, "The simplest truths are usually those which are the last to force themselves upon us." "It is," observes Sir C. Lyell, "by assuming such reiterated variations of level, each separately of small vertical amount, but multiplied by time, till they acquire importance in the aggregate, that we are able to explain the phenomena of denudation. By such movements, every portion of the surface of the land becomes in its turn a line of coast, and is exposed to the action of the waves and tides." By what agency of elevation, can we conceive the upward motion, if applied *beneath* the land, so equable and

gradual? 'Tis passing strange that philosophy should so persistently regard the unstable element, which *must* indicate upon its superficial contour any change of the equilibrium *maintaining* a given centre of gravity, as "a fixed hydrostatic level," by which to measure the supposed elevations or depressions of the solid land. If the case were reversed in this age, and Newton's theory of solar attraction, acting unequally upon an otherwise unaccounted for, and but—imagined equatorial bulge, held to corroborate a notion hazarded that the globe was, and is, a ball of liquid fire, upon which our earth is but the hardened crust,—how incredulous would philosophy display itself!

The *North British Review*, No. lxix., page 77, states that "in a raised beach at Leith, fragments of Roman pottery, along with bones apparently of deer, and littoral (sea-margin) shells have been discovered at a height of twenty-five feet above the sea," and suggests that "so great a change within so recent a period tempts us to pause before we give assent to the enormous intervals of time which some geologists demand for the accomplishment of other changes that have elapsed since the advent of man."

"The discovery of the Mastodon Giganteus in Orange County, State of New York, now in Dr. Warren's museum, in Boston, with five or six bushels of pine and maple twigs in excellent preservation in the cavity of its abdomen, and with the vegetable fibre still undecayed in the hollows of its teeth, settled the question of the remote antiquity of that mastodon's last meal. . . . The tradition of the Indians is explained, who report that their fathers had seen in the forests large deer, never lying down, but leaning against a tree while they slept—tree-eaters with a hand (trunk) on their faces."

In the Book of Enoch, rescued from oblivion by Bruce, the traveller, in Abyssinia, there is evinced on the part of its author acquaintance with astronomical phenomena. Its authenticity has been denied on the ground that it has apparently been composed by two individuals, one of whom must have resided south-west of the Erythrean Sea, that is, of the Persian Gulf, Red Sea, and that part of the ocean which washes the shores of Arabia; therefore the place delineated by him must have been south of the Abyssinian mountains, and in or about north latitude 9° and longitude 36°. He describes the longest days as containing twelve parts out of—eighteen, the whole number into which the day was then divided. Now twelve are to eighteen, as sixteen to twenty-four hours in our mode of computation. Ergo,

the theologian reviewers of the Book of Enoch hold that the book could not have been written in latitude 9°, but that one of its authors must have resided farther north, a distance of not less than 36° of latitude, or in 45° to 49° north latitude, where the longest days are from fifteen and a quarter to sixteen hours.* But if a point south of the Pyramids, now in north latitude 9°, was, when the Book of Enoch was written (accepting its authenticity as the work of Enoch), prior to the Noachian Flood, in north latitude 45°, the position of the Pyramids then must have been in or about the latitude of Archangel, a position of great astronomical importance as a site for observations of the increasing tilt of the globe on the plane of the ecliptic, and computations of the period when its progressing change must necessitate a physical catastrophe, as the result of an inevitable loss of equilibrium and overturn. The climate also of 66° north would be one conducive to energy in labour far in excess of that of semi-tropical Egypt of the present time. But the disclosures of geology lead to the belief that prior to the Noachian flood, Great Britain was in a climate of glacial severity, while our southern coast of Australia was in one of tropical characteristics, which would be the relative coincidences of change of the latitude of the Pyramids from lat. 30° N. to lat. 66° N. ; and that such changes have recurred in the past antiquity of our earth is amply unfolded by geology.

Sir R. I. Murchison remarked that “the commencement of the first glacial period in the history of the Alps was synchronous with an enormous dislocation and upheaval of that chain, and coincident with a vast *change in the level* of materials constituting the then existing lands, and their debris, which had previously lain beneath the waters. . . . Such dislocation was of the same date as that which submerged a pre-existing northern continent, and brought it under the influence of a glacial sea.” Cuvier observed that, “if there be anything settled in geology, it is this—That the surface of our globe has been subjected to a great and sudden revolution, the date of which cannot be carried much farther back than five or six thousand years; that that revolution broke down and made to disappear the countries which had been before inhabited by men, and the species of animals with which we are now best acquainted; that, on the other hand, it laid dry the bottom of the immediately preceding sea, and formed

* “Enoch Restitutus.” By Rev. Edwd. Murray. London, 1836. See page 66 and ante on the comparison of the chronology of Enoch with the Hebrew computations.

the countries which are now inhabited. . . . But the countries now inhabited, which had been laid dry by that last revolution, had been inhabited before, if not by man, yet at least by land animals. It follows that preceding revolutions—one at least—had buried these regions beneath the water." May not all the phenomena disclosed by Geology—in denudation of surface ; alternate depression and elevation of vast areas ; deposition of layer after layer of sedimentary strata ; erosion of the great valleys ; in fact, formation of our mountains, as the macerated bones of primeval plateaux, disrupted, torn down, and excavated by aqueous action, with all noted climatal revolutions, including glacial epochs,—be referable to, and, on sound principles of natural philosophy, only lucidly explained by the simple though heretofore overlooked material first cause—change of the earth's centre of gravity ? The earth being spherical, having an unstable fluid envelope, resting within the hollows and irregular surfaces of the external crust, which is apparently "standing in the water, and out of the water," is subject, as to the extent and relative position of its areas of land surfaces, to the interchanges of position and rearrangements of volume of its oceanic envelope, tending to apparent elevation or depression of land with reference to ocean level, which must result inevitably from operation of the imperative natural law of gravitation of the fluid envelope, so as that its exterior shall present a surface, horizontal at each point of radius vertical to the earth's centre of gravity, and *thus only* maintains an equilibrium ;—continuous change of centre calling into action the diurnal tide wave.

It has been frequently asserted by those delighting to turn the edge of reasoning aside by flippant jestings, that I hold and assert the idea of such an extended polar apex as to constitute a pear or lemon-shaped earth, by polar ice accumulation. But such extension of apex is an unnecessary fiction. Any extension of the polar radius by ice would necessarily affect the equilibrium of the sphere, though of small bulk compared with the equatorial bulge *assumed* by the astronomer, as causing the earth's tilt by stellar attraction. Altitude of ice continents, and of sea surfaces, are ascertainable by the barometer, and it would be a most interesting subject for scientific investigation, if, by competent observers, and finely graduated instruments, the relative rise and depression of oceanic surfaces, at rest, all over the world, could be contemporaneously recorded, at successive periods, after lapse of stated numbers of years. "The assumption that the earth is an oblate spheroid, or orange-shaped, was suggested

by the consideration of its diurnal motion, which is supposed to generate a centrifugal tendency, and thus originate the abnormal figure. And yet, with reference to this view, the physics of the earth show that this centrifugal tendency does not exist at its equator now, for the equatorial oceanic currents, and cloud ring, are passing continuously from east to west, or receding upon the axial motion; whereas they should be advancing upon it, or passing from west to east were centrifugal action in operation. It is held to be fully established by the satisfactory way in which it accounts for precession, nutation, and recession, the very phenomena it is required to explain."* In fact, it "is a necessary assumption with modern science, for without a protuberant equatorial ring, the moon, planets, and sun would have no displaced matter through which to exercise perturbing force; and therefore precession, nutation, and recession would be unaccounted for. Hence, if the earth is not an oblate spheroid, modern science has failed to explain the cause of these phenomena,"† or of the oceanic tides. The hypothesis of occasional change of the earth's axis, has been brought forward very frequently of late years by some of the first authorities in science. Amongst these may be mentioned Professor Haughton, of the Dublin University, Sir Henry James, and Mr. John Evans, Fellows of the Geological Society. Alleged astronomical difficulties, which may not bear a sifting analysis, have heretofore too readily quelled a thorough scrutiny of the question. Sir Thos. Airy, the Astronomer-Royal, in his report to the Board of Visitors for 1861, regarded such a contingency as not impossible, however, stating "The Transit circle and Collimators still present those appearances of agreement between themselves, and of change with respect to the stars, which seem explicable only on one of two suppositions, that the ground itself shifts with respect to the general earth, or that *the axis of rotation changes.*"

Sir J. F. Herschel asserts, as proof of the astronomical assumptions that the polar axis is a fixture, and that the solid earth participates with the fixed axis in the motion of rotation, as if the axis "were really a bar of iron driven through it," "That the latitude of places on the earth, or their situation, with respect to the poles, have undergone no change since the earliest ages. 2nd, that the sea maintains its level, which could not be the case if the motion of the axis were not accompanied with a motion of the whole mass of

* Dr. Pratt. "Astronomical Investigations." London, 1865.

† *Ibid.*

the earth ; local changes of the sea level, arising from purely geological causes, being easily distinguished from that general and systematic alteration which a shifting of the axis of rotation would give rise to." But our investigations demonstrate the untenable character of these assumptions ; for, 1st, Herschel elsewhere indirectly admits that existing calculations of latitude may be proved erroneous, that a "more exact knowledge of the physical structure and figure of the earth will render a different manner of considering it necessary." And, 2nd, The level of the sea, or the position of its surface at quiescence with reference to elevation of lands "standing in the water and out of the water," we demonstrate by the phenomena disclosed by Geology, to be subject to just such alterations as change of the centre of gravity of the globe itself, and consequent "shifting of the axis of rotation, would give rise to." Observations in astronomy appear to indicate that, while the magnetic pole may continue to point to, or retain the same direction with reference to the celestial sphere, there is an inherent motion pertaining to the earth itself, as mere inert matter controlled by the *law of nature*,—termed terrestrial gravitation, and hence that its retention of its position of inclination upon the plane of its orbit, or its aspect relatively to the sun's path, depends on the continuance of its component matter throughout its whole structure in a state of absolute and perfect equilibrium. If, however, changes recur from time to time, either of external symmetry, or in the density of large portions of its volume internally, or by unequal prolongation of a section of its contour by deposit thereon of dense material, the over-weighted apex of a finely poised sphere must over-balance it, when it must proceed to re-adjust itself in equilibrio, assuming, as to its equator, a new angle of lean, or tilt, towards the plane of its previous position. Thus celestial points, such as the Pole Star, and other constellations, will consecutively appear to relatively increase or decrease in longitude as computed heretofore, and tropical time will vary accordingly. Astronomers recognize these changes under one grand chain of phenomena termed the Precession of the Equinoxes, whereby the equinoctial intersects the ecliptic with a progressively varying angle, yielding a result of a continuous change of time of the sun's apparent altitude. Such time lessening, or, rather hastening, in the northern hemisphere, but being protracted or retarded in the southern hemisphere, relatively, though not affecting the actual or sidereal time, so that when the phenomena of the Precession of the Equinoxes shall be read

aright, and freed from the erroneous assumptions now current as to their cause and immediate and ultimate results, it will be seen to give such changes of the periods of high noon in both hemispheres, as must necessitate new computations for the guidance of mariners to ascertain latitudes, and afterwards the longitudes of their positions at sea. Presently, longitudes are computed by chronometer time from definite initial points, the sites of European Observatories. At first sight, it appears easy to define meridians of longitude east or west of these sites, calculating 15 degrees for each hour of the difference of the local time of high noon with that of the initial point selected. But if the action of the phenomena of the Precession of the Equinoxes,—that is the operation of terrestrial causes, in tilting the Earth upon the plane of the Ecliptic, and thus constantly altering the relative position of points upon the Earth's surface with reference to the Sun—is to hasten the time of high noon in the northern hemisphere and retard it in the south, by ever so small an annual fraction of time, the result is a progressing variation in position of latitudes and longitudes, as previously defined, so that as there will be a continuously minute retardation of the time of high noon in the Southern hemisphere, there must be an apparent corresponding diminution of longitude.* Hence, the eastern boundary of the province of South Australia will be found at each adjustment of it (if continued as the 141st degree of East longitude) to overlap in an increasing amount its previously defined limits, and extend into Victoria. The writer submitted this view of the question several years ago, and now the re-adjustment of the boundary being called for, the actual facts corroborate the accuracy of his prognostications, and demonstrate necessity for a fixed line of demarcation. At same time, *no* question can vie in importance with one so absolutely bound up with precautionary measures for ensuring the safety of mariners throughout the world; and no time or expense should be spared in its thorough investigation, and in the computation and publication of data, whereby apparent variations in position of previously defined points in latitudes and longitudes, such as islands, reefs, shoals, &c., may be ascertained by the mariner, and the causes of apparent discrepancy of observations taken now, as compared with previous ones, duly accounted for. The use in the present day by Science of the coffer in the Great Pyramid for the purpose I submit as its original design, and renewals of the experiment at successive periods of years,

* That is, the defined site on the 141° east longitude, will in after observations be in longitude 140° so many minutes.

and comparison of the levels of the striæ of Scottish valleys, with the local surface level of standing water, investigated with most scrupulous regard to accuracy, might furnish data for the geometrician to frame computations of the subverting energies still at work, by natural law, to disturb the earth's equilibrium, and accomplish an aqueous catastrophe, similar to the only one traditionally known to our race, but of the recurrence of which, at many successive periods of the earth's antiquity, some geologists have largely treated, and submitted many proofs.

CHAPTER III.

CONTENTS.—Existing aspect of geological or theoretical surmises to mining — On the formation of Coal, place of its deposit, and suggested mode of search for it—Variance of Victorian geologists' ideas as to occurrence of gold, with results of Californian and Victorian experience—Encouragement to mining on physical principles—Description of an economical boring apparatus—Concluding remarks.

BELIEF, when accorded, as to existence of a *cause* of loss of our sphere's equilibrium, and hence overflow of her oceans, is practically tantamount to admission of certain necessary *sequences of effect* upon the crust of the earth; and these are amply evidenced, though ascribed by some geologists as emanating from simple causes, acting uniformly throughout an infinity of time with *no* such catastrophe intervening as the Noachian Flood. Hence *its* action in denudation, disintegration, or disruption into masses, and deposit in new strata, of the primary rocks, is not duly explained to the miner, who might materially profit in his enterprises by intelligent reasoning on such premises. He often suffers loss by abandonment of mining claims, because Geology affirms certain varieties of rock to be the *bed*, beneath which it is vain to search for gold, not seeing that aqueous disruption may have torn away sections of former hills, and precipitated huge masses of stratifications into the positions presented as beds to the miner, and thus the most ancient strata may be locally subverted, and may be superincumbent upon recently deposited payable gold drifts. Again, the position of quartz lodes may be affected by denudation of supporting walls, and the disintegration, and deposit of their particles, or of large masses, apart from their position *in situ*. *Here*, in this ancient valley, the miner carries expensive shafts, and drives, almost at random, in search of the auriferous gutters. *There*, on yonder range, he has "worked out" what he deems a flat reef, but which is a portion of the lode *in situ*, broken off, and precipitated downwards, in some land slip, from excavation, and denudation by torrents,

oceanic, or other, in a former period of our globe's history. The local characteristics of a landslip, when recent, may have been long obliterated, by the levelling action of water-flow; and sedimentary deposits may have hidden the aspects of processes we are left to *discover* by the operations of the intelligent miner. In such cases the reef *in situ* should be sought for, on physical reasoning on the conjectured position in the hill, or valley side, adjacent, from which the mass has fallen. Our alluvial miners, again, are often perplexed by theories of lava flow, reef washes, &c. Hence, good and extensive alluvial claims, largely productive for a time, are too often abandoned. Boring to moderate depths by improved machinery is by no means so costly as of itself to induce capitalists either to work their mines expensively, by shafts and drives, while only prospecting, or to abandon them. But though our most valuable nuggets, and much good gold has been got very near the surface, the geologist assures the miner that he must sink through some four series of basaltic layers before he can reasonably hope to reach truly payable wash. In Mexico and California the very richest drifts have been traced from pits sunk on the outflow of almost surface drifts, and several *successive layers* of payable wash are regularly worked in very many mining claims. By amalgamation of adjacent claim-holding companies on the Ballarat gold field, similar discoveries of successive layers of auriferous, and amply payable drifts, throughout all, or most of the areas now deemed worked out, might be made by boring, which should supersede the groping in the dark, with haphazard aims, at expense destructive to the enterprise in very many cases, as the shareholders soon withdraw confidence, and withhold necessary calls.

Coal is also too often prospected for on false principles of mining by shafts or bores, at haphazard, in what is deemed "likely looking ground" for yielding carbonaceous strata. But if catastrophic aqueous action at successive epochs be admitted, as also the origin of coal, as being from drift into amphitheatre-like hollows of sea bottom, of sea-meadow foliage (and the marine palm-like trees of the southern ocean, adjacent to Terra del Fuego, some of which are stated to grow 1,500 feet in length, with soft woody stems and leaves, are similar to the foliage of palms in the tropics), which I suggest as the origin of coal formation, we must examine the dip of the more ancient stratifications, and bore towards the former beds of depressions in the earth's crust. A late article on "Marine Flora" in *Chambers's Journal* states that "a curious fact is found in the intimate relation which

exists between the dimensions of the seaweed and the largeness of the seas which they inhabit, thus :—In the Mediterranean the smaller kinds are found ; in the Atlantic Ocean, larger ; in the Arctic Ocean, the long-leaved laminaries ; and in the Antarctic, the vastest body of water in the world, are seaweeds which have been compared to marine trees, such as the gigantic *Durvillea*. Among the most remarkable forms of the marine flora, sailors have noticed some, the importance of which is out of all proportion with what is seen in other seas. These banks of fucæ spread over the surface of the water like meadows, on the green sward of which the foot might seem safely to tread, so thick and solidly bound together are they. Every sailor knows the one which is situated between the Azores, the Canary Islands, and the Cape de Verd. . . . Another mass, nearly as considerable—that is, about six times the size of France—extends itself in the Pacific Ocean, not far from the California coast. The seaweeds come from all parts, torn from the shores of many lands, and carried by marine currents, or the action of the waves, they form enormous vegetable banks, which float on the surface of the waters.” Search should be made by boring only in *natural amphitheatres*, or localities defined by the geologist as having apparently possessed those characteristics, before being denuded of the surrounding eminences, and filled with sedimentary deposits after each period of oceanic submergence. Rock-salt might, probably, be also found by boring in localities of similar features, possessing surface brine springs or salt lakes.

In the *Argus* summary for England of date October 7th, 1874, it is stated, that “Of the large deep lead alluvial mines of Ballarat, most of them appear to be now worked out.” I differ from this idea *in toto*, and believe that more gold will be found yet in many of those claims—*by boring*, as a preliminary mode of search for the ancient gutters, previous to the sinking of shafts, and making the drives, necessary to bring the treasure to the surface,—than has yet been found in even the richest leads below the fourth rock ; and leads or gutters will yet be found at levels approximating to the shallow depth from the surface, of the old Golden Point lead, as worked in 1851, at the depth of only 18 to 25 feet. If prospecting be now initiated upon *physical* principles, our early mining glories will soon (I firmly believe) be far eclipsed by the result attained. As the *Argus* summary has it, “for many years past there have been no discoveries of any such large leads as formerly gave employment within a week or two of their discovery to

thousands of miners, at once enriching many of those who bottomed on the gold, and forming the nuclei of mining townships." Yet we have had a Department of Mines, and a so-called Progressive Mining and Geological Survey of Victoria! A learned geologist as Secretary of Mines!! and £10,000, voted for prospecting, lying inert for many months of a seriously depressing crisis in mining!!!

Geology, however, when its theories are based on a tissue of hypothetical surmises, discarding the physical agencies ever at work in re-modelling the external aspect of the earth's crust, is often painfully at fault as regards its assumed disclosures; or, rather, these are too often misinterpreted by those professing to be thoroughly versed in the science. Hence mining enterprise is sadly discouraged. The working miner has not capital to enter upon claims, requiring, according to geological theories, very deep workings to reach the golden drift; and the capitalist withholds aid, usually, until prospecting has given a clue to the position of a payable wash. With the discouragement to mining for alluvial gold, there has resulted a diminution in the number of experienced miners at work. Let but a reaction take place, by discovery by boring, that gold leads of payable quality are attainable by mining industry in nearly every one of our great valleys, and can be payably worked (and re-worked) at several successive levels, and an immense stimulus to increase of population must ensue. The writer, in his work on "Auriferous Drifts," published in 1868, now out of print, combated the assertion of the then Victorian Geological Surveyor, Mr. Selwyn, as to the improbability of discoveries of gold drifts in Gipps Land. Mr. Selwyn had published a letter dissuasive of search in that district south of "the Moe to Hayfield; thence to Ben Cruachan and Mount Wellington; and thence south-easterly to Lindenow and the coast;" alleging that it was "highly improbable, if not indeed *impossible*, that rich leads would be found inside, or south of the line indicated. . . . Under the country referred to, the gold rocks are buried far beyond the reach of the prospector's pick or boring rods." The author's prognostications, however, proved to be correct as to a great probability of auriferous drifts being found within this proscribed area, considering that the rivers had for ages brought down debris from the mountains; and he is convinced that startling discoveries will yet be made of richly payable drifts, or beds of wash-dirt, at depths beneath the Gipps Land plains, much *more shallow* than as yet sought for or discovered. He is also convinced, from the numerous evidences afforded by disclosures of water-worn quartz, and varied

wash-dirt yielding gold, in the valley of the Yarra, at many parts of its course, and from the enormous deposits on the shores of the Bay of Port Phillip of black sand, an indication of a vast amount of rock-disintegration, that an enterprising metropolitan gold-mining company, mining between the City and the Domain, would meet with such satisfactory results as would encourage mining in ancient channels in every promising river of the Australasian colonies, having a permanently defined bed, or course between escarpments of rock. The author has, in former years, had it in view to apply for a lease of that ground, but the illiberality of the Victorian Government to him, as the first publisher of the early discovery of gold in Victoria, at date of June 7th, 1851, and the manner in which his claim for this and a later discovery of a gold-field, the nucleus of the settlement of a large population in the Gipps Land ranges, has been evaded by the permanent head of the Department of Mines, has deterred him from personal action; though, as having been an early and enterprising Victorian colonist, in establishment of new industries, he would willingly devote (as he hereby does) a part of his leisure to promote the prosperity of his adopted land.

Professor Silliman, of the United States, has visited and described many of the Californian gold deposits. He remarks—"We find it impossible to admit the existing river system as a cause adequate to the spreading of such vast masses of rounded materials; the facts plainly point to a much greater volume of water than any now flowing in the valleys." Professor Hitchcock, in his "Geology of Massachusetts" observes, that "all the diluvium which had been previously accumulated by various agencies, has been modified by a powerful deluge sweeping from the north and north-west, over every part of the State, not excepting its highest mountains." Similar evidences of action of a tumultuous flow of water are traceable throughout Australasia, and in our Victorian mining enterprises, the fact should be admitted, and operations conducted, as in view of such fact. Masses of formations of concreted water-worn gravels, upwards of 1,000 feet thick, upon a granite bed, are worked by mining enterprise in California. Gold is said to be obtainable throughout the entire mass, but in greatest quantity near the bed rock. The ancient river channels are clearly marked by a line of rock on either side, containing a blue cemented gravel, requiring crushing, but very rich. "Bangor is on an old channel, the bed of which is about 60 feet below the level of the lowest ravines in the neighbour-

hood. This channel was discovered in 1857, by some miners, who, while running a cut in a ravine, found the bed rock dipping down, and after following it as far as they could in the cut, they went off some feet, and sunk a shaft, which in 65 feet struck a rich stratum, which paid 100 dollars a day per man. The existence of a channel being proved, the outcroppings of the vein rocks at the ravines, and on the hill sides, showed its course, and it was claimed for miles." . . . "In the spring of 1851 three Frenchmen found an extremely rich old channel high up on the side of French Hill, north-east of the town of Mokelumne Hill, and in a few days they took out 180,000 dollars worth of gold; one piece weighing eleven pounds." . . . "The old channel at Springfield was discovered in 1852 in a shaft (only) eight feet deep, on a flat from which the basalt had been washed away."* In view of such discoveries in California, and a similarity of structure of our hills, and ravines here, capped with lava or basalt, and containing substrata of alternate series of quartz gravels, sand, and pipeclay, I have repeatedly urged search for gold in drifts in the sides and bed of the Bacchus Marsh valley, as also the valley of the Moorabool, and others. But the head of the department of Mines replies, that as yet certain fossils are unknown in the vicinity, and until these are discovered, it would be premature to anticipate payable gold! In the doubt thus promulgated, mining energies evaporate. The worker cannot afford to prospect unadvisedly, the capitalist disowns such enterprises, and mining languishes. Even with the great aid proposed of a large parliamentary subsidy, the experience of results from *official* prospecting is far from encouraging. But if attention be now devoted to questions as to the physical agencies resulting in modifications of the structure of the earth's crust, and deposit of the weightier particles of matter in the furrowed channels of ancient valleys, and retention there under subsequently deposited agglomerations of earths,—the precipitated sediment from a superincumbent ocean, until re-excavated by renewed aqueous action, and here and there deposited in other channels, the general course of which (when not diverted by obstructing escarpments of rock), being of an approximately north and south trend—it must be admitted that Victoria presents an almost unlimited scope for mining energies, and enterprise, with largely payable results in prospect. Mining enterprise has disclosed the fact of there having apparently

* "Resources of the Pacific Slope."

been a succession of surfaces, each displaying a layer of *mould*, or surface soil, apparently the last slowly deposited sediment from a volume of superincumbent water, holding earthy matters in suspension. Each successive surface must have had its own channels of river flow. Thus leads may be discoverable at each level of these successive surfaces, though widely separated as to their position and trend in an extensive ancient valley, from the locality of present prospecting shafts and drives. Hence propriety of extended boring operations, as the preliminary to sinking shafts. Mr. R. Brough Smyth, in his recent "Progress Report," page 12, observes that "at Freestone Creek, Gipps Land, the miners have found gold in the bed of the stream which intersects rocks marked on the maps as of upper palaeozoic age, and heretofore regarded as non-auriferous." It is a great mistake to sink through superincumbent strata past the indications of former surface levels, each having its own system of watershed, and deposit of disintegrated formations, and their water-rolled gold, without an effort to trace such ancient channels, solely because geologists, in face of the fact that water-worn gold, and our heaviest nuggets have been found within a few inches or feet of the surface soil, affirm that certain layers of rock must be passed through. The "worked-out" block claims on Ballarat should be tested at new levels, by bores every 50 or 100 yards, from west to east of their areas before being abandoned. The first bores I would advise being put down only to the depth of 120 feet, a by no means expensive operation.

To quote from my pamphlet of 1868,* "The discoveries in and adjacent to the great Ballarat valley, are but in their commencement. If the great interest of mining in these colonies, as the chief attraction to population, the proper source of revenue, and dispenser of wealth, and prosperity, —as well to the future nations, of which the early colonists are but the nuclei, as to the commerce and industrial production of the world,—receives its *due* share of legislative support; and research be directed upon scientific principles, and by adequate appliances,—which may henceforth exercise the engineering skill of the world to profit—there need be now *no* limit to the wealth realizable from shallow or deep leads. Boring operations . . . are especially indicated." 'Tis strange that seven years should elapse since these sentiments were published, before the Legislature are moved to duly subsidize mining explorations by boring.

* "Auriferous Drifts in Australasia."

But seeing that action of physical agencies other than the very trivial operation of "those of which we have experience," are denied by Mr. Brough Smyth, or "that nature worked at times convulsively," notwithstanding the evidences there are of revolutions of ocean surface, yielding a vast denuding, disintegrating, and drifting force; and an unintelligent and prejudiced mode of reasoning, induces disregard of the labours of the student of physics to discover and disclose the primary cause evoking epochal displays of such force, the present depression fallen upon mining enterprise, and reduction of the number of working miners now in Victoria, alluded to in the *Argus* summary quoted from, is only what we have had reason to expect.

In his Progress Report Mr. Brough Smyth, in advising as to a locality near Coleraine suitable for a search for coal, remarks, "We are guided more by the lithological character of the rocks than by the *dips* yielding conclusions respecting the structure of this part of the trough." This is an instance of the difference of our opinions as to the several conditions under which coal is produced, and the circumstances which should guide us in the search for it. I hold, on physical principles, that the *dip* is the main point. The deposit of vegetable matter transformed into coal, if there be any local deposit thereof, will be in the bed or deepest hollow of the original trough, or depressed surface. This, at every succeeding epoch of oceanic submergence, would be more or less filled up with sedimentary deposits, including, possibly, layers of vegetable accumulations, drifted and precipitated from the superincumbent ocean, as filled with mechanically suspended *debris* of the lands over which the tumultuous waves of an ocean, broke loose from its barriers, had swept. So long as a *depression* remained, so long would there be deposit therein, whether of earths, sand, or vegetable matter—the latter, now lignite, or coal, according to age. But where the surrounding structure of the rocks indicates a depression, similar at a former epoch to the characteristics of an amphitheatre, or lake, the finding surface, or shallow, indications of a seam of lignite, or coal, would appear to me *prima facie* evidence of thicker deposits, to be searched for beneath by boring. In the Atlantic Ocean, some 1,200 miles west of the Irish coast, there is said to be an abrupt depression of the ocean bed to the depth of some 7,000 feet. If the present ocean presents, as is probable, as varied an aspect of bottom surface as our mountains, valleys, and plains do superficially, there must still be depressions of many hundred feet deep

to be filled up by deposits. And as similar operations in Nature have in all probability been progressing during ages of the antiquity of our globe, coal, could we but reach to, and work it, without flooding, may be in store in these depressions, in consecutive layers, to the depth of *thousands* of feet. We have seen that in English coal mines it is worked to the depth of nearly half-a-mile. When apparently worked out at one level, it may, on physical principles, reasonably be prospected for at a lower one, and practically there is *no limit*, but by flooding, or difficulties as to ventilation, to mining operations being executed by men and horses, to any depths man's energies can reach.

Whenever gold-bearing formations, or quartz reefs, have been noted, adjacent to depressions, characteristic of former excavation by water, though not now stream-channels, auriferous gutters may be confidently searched for by boring, as the heavier portion of the disintegrated debris of such formations remains in the ancient channels, stored up as it were, until broached by the miner's pick or boring tools. Mr. W. Mather, of Manchester, appears to have invented a boring apparatus of great utility, described as "ingenious in its simplicity, and very effective, and much more expeditious than the former practice of using iron rods, the weight of which, at great depths, becomes enormous. A steam-engine, a flat hemp rope, a few boring tools, lifts, and grapnels of various forms, constitute the working apparatus. A hole is bored in the ground in the usual way, then the boring tool, attached to the end of the rope, is let down, and made to give a succession of blows on the bottom, being turned slightly round at every stroke. In this way the bottom, whether clay, gravel, chalk, schist or rock of any kind, is broken and penetrated; the tool is wound swiftly up, the lifting bucket is hooked on, and speedily brings up the loosened material." By this apparatus, bores of 18 to 24 inches diameter have been executed to depths of many hundred feet, sinking "through chalk and flints, at the rate of one foot eleven inches per day. The number of men employed, including a smith to sharpen the cutters, never exceeded six."* This apparatus might accomplish, cheaply, all the purposes of the diamond-faced bores brought under the notice of the Government by Mr. Woods, M.P.

The late revered Dr. Chalmers remarked that the philosopher, "the great Sir Isaac Newton, the highest man in the accomplishments of philosophy which the world ever saw, sat

* Chambers's Journal of May 23, 1870.

at the Book of Nature in the humble attitude of its interpreter and pupil." In such attitude we must work, in searching for truth as for hid treasure. Dogmatism is wholly out of place where theories are merely based upon assumptions, especially if overlooking the sequence of action of natural laws.

The possibility of maintaining and propagating error, by permitting ourselves to be deluded, or partially convinced, not to say prejudiced, by one-sided reasoning, and neglecting subsequent investigation of the matter submitted, should impose caution upon teachers of science. Piazza Smith, the Astronomer-Royal of Scotland, admits that there is a long felt physical doubt as to the want of perfect constancy in relative position, throughout long ages, between the crust of the earth, and the direction of its axis of rotation, and also a probable error of the best modern determination. Some geologists look to the possibility of change of axis, as the only solution of the difficulty presented, in demonstration of an adequate force, productive of the revolutions disclosed by geology. *Here*, to our teachers, it is all plain sailing. "All things continue as they were from the beginning of creation." All is known, and "easily understood," and there is no necessity for innovation of new ideas, or re-interpretation of ascertained facts. Such is the view asserted by our Victorian authorities. Nevertheless, I again submit my ideas, for *Magna est veritas et prevalebit* eventually. And I conclude with the memorable and noble words of Schiller: "New discoveries in the field of his activity, which depress the mere Trader in Science, enrapture the true Philosopher. Even should a new series of ideas, a new aspect of Nature, a newly discovered law in the physical world, overthrow the whole fabric of his knowledge, *he has always loved Truth better than his system*, and gladly will he exchange her old and defective form for a new and fairer one."

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